

SOCIAL PHYSIQUE ANXIETY AND THE DOSE-RESPONSE EFFECTS
OF ACUTE AEROBIC EXERCISE ON SELECTED
PSYCHOLOGICAL RESPONSES IN FEMALES

By

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By

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The purpose of the present investigation was to examine the dose-response effects of aerobic exercise on psychological well-being within a self-presentational framework. Volunteers completed pre-screening inventories pertaining to their level of social physique anxiety (SPA) and typical weekly physical activity. Participants who scored 36 or greater on SPA and reported two or fewer exercise sessions per week were eligible for inclusion in the sample. Upon meeting the inclusion criteria, 30 female participants were randomly assigned to a prescribed or preferred intensity exercise group. Volunteers in each intensity group completed three randomly assigned, counterbalanced conditions: (1) stationary cycling in a self-presentational environment, (2) stationary cycling in a laboratory

environment, and (3) quiet rest. Assessments of psychological states were obtained prior to, during, and 5, 60, 120, and 180 minutes following each condition.

Results revealed that increases in negative psychological states emerged during the self-presentational condition only. Furthermore, while improvements in affect emerged 5 minutes following both exercise conditions, these beneficial changes persisted longer following the laboratory condition. No significant improvements in affect were detected during or following the quiet rest condition.

Given the divergent pattern of in-task and post-exercise affective responses, the findings suggest that the socially evaluative nature of the exercise environment serves as a moderator of improvements in psychological states during and following acute exercise for high SPA females. Therefore, both SPA and the social context of the exercise session are crucial determinants of the dose-response effects of acute exercise upon psychological well-being.

CHAPTER ONE INTRODUCTION AND REVIEW OF LITERATURE

Self-presentation, or impression management, represents the processes by which individuals monitor and attempt to shape the way others perceive them through the selective presentation and omission of various aspects of themselves (Leary & Kowalski, 1990). Although people employ self-presentational processes in an attempt to foster positive impressions among others, the use of these strategies can be interpreted as an attempt to perpetrate social deception (Schlenker, 1980). However, in contrast to this assertion, Leary (1992) suggests "Although for many the concept of self-presentation often evokes images of Machiavellian deceit, self-presentation is neither inherently deceptive nor manipulative. On the contrary, it is a natural and necessary component of human interpersonal behavior" (p. 339). Thus, while people attempt to convey images of themselves which will foster a positive impression with others, self-presentational processes are not employed in an attempt to display a false identity and have been found to be constructed in a manner consistent with one's own self-concept (Leary, 1983). Therefore, the use of self-presentational processes may be best described as an attempt to emphasize the most desirable aspects of one's self in order to maximize social rewards and minimize social punishments (Leary & Kowalski, 1990).

In North America, the desire to foster positive social impressions is of particular salience in regards to physical appearance. For example, billions of dollars are spent by

individuals within the United States each year on cosmetics, medications, diets, and surgical procedures in an attempt to appear more attractive to others (Brownell, 1991; Leary, Tchividjian, & Kraxberger, 1994). Societal pressures to conform with the modern standard for attractiveness (i.e., lean, fit, and athletic) may motivate many individuals, particularly women, to attempt to modify the appearance of their physiques.

Altering the appearance of one's body, however, is not easily accomplished. Given that women are consistently exposed to unrealistic depictions of the female body shape within the media, it is not surprising that attempts to attain the idealized physique often prove futile (Brownell, 1991). The inability for females to acquire this unrealistic physique may result in body dissatisfaction. Consequently, displeasure with the appearance of one's body may stimulate concerns that others are viewing their physique unfavorably, resulting in the experience of social physique anxiety (SPA; Hart, Leary, & Rejeski, 1989). SPA, an affective component of body image disturbance, represents a subtype of social anxiety that stems from self-presentational concerns about the appearance of one's physique.

While individuals who are not concerned with other's appraisal of their body may rarely experience SPA, those preoccupied with concerns regarding physique evaluation may experience extreme distress during situations in which the physical self are prominent.

The realization of self-presentational physique concerns may result in both healthy and unhealthy behaviors. For example, doubts regarding the ability to project a desired body image may lead some women to adopt more healthy exercise and dietary behaviors (Hayes & Ross, 1987; Silberstein, Streigel-Moore, Timko, & Rodin, 1988). In contrast, heightened physique concerns may also lead some women to utilize pathogenic weight

control strategies (Brownell, 1991; Rodin, Silberstein, & Streigel-Moore, 1985). Prior reports indicate that eating disordered individuals display an intense fear of rejection, an excessive need for social approval, and greater motivation to fulfill others' expectations than those of normal weight (Bruch, 1978; Leary & Kowalski, 1990; Weinstein & Richman, 1984). In accordance with such findings, the importance of appearance related self-presentational concerns in the genesis of pathological health behaviors cannot be overlooked. Although increased interest has emanated in the connection between self-presentational concerns and negative health behaviors (Leary et al., 1994), attempts to delineate the influence of SPA on health behaviors remains equivocal (Crawford & Eklund, 1994; Eklund & Crawford, 1994; McInman & Berger, 1993).

Social Physique Anxiety and Exercise Behavior

Individuals with poor body image may doubt their ability to self-present in an attractive manner and experience SPA in socially evaluative settings. Consistent with sociocultural theories of body image (Silberstein et al., 1985), SPA has been found to be more prevalent among women than men (Eklund, Kelly, & Wilson, 1997; Petrie, Diehl, Rogers, & Johnson, 1996). Furthermore, Petrie and colleagues (1996) found that higher SPA was associated with being less lean in females, but not males. Therefore, the intensity and direction of SPA varies by gender.

Due to the evaluative nature of the exercise environment, SPA may be particularly salient within physical activity settings (Leary, 1992). SPA has been shown to be related to physical appearance motives for both participants and leaders of physical activity (Crawford & Eklund, 1994; Hausenblas & Martin, 1999). In an examination of the

correlates of SPA among female aerobic instructors, Hausenblas and Martin (1999) found that women who instructed for self-presentational motives reported higher SPA than those who instructed for affective or leadership motives. Crawford and Eklund (1994) observed that females with high SPA reported exercising for the derivation of self-presentational benefits such as achieving body tone, weight control, and physical attractiveness more frequently than enjoyment or health related motives. This relationship remained robust after statistically controlling for body fat percentage. Thus, the endorsement of self-presentational motives for exercise participation cannot be exclusively attributed to a perceived need to decrease body fat.

In addition to the well established relationship with exercise motives, SPA has also been demonstrated to influence individual's attitudes and perceptions of the exercise environment. Spink (1992) reported that women with elevations in SPA preferred exercising in private rather than public settings. Crawford and Eklund (1994) found that sedentary women with high SPA reported a preference for an exercise setting in which the participants wore less revealing workout attire. Eklund and Crawford (1994), however, were unable to replicate this finding in a subsequent investigation of physically active females. The authors speculated that the observation of negative attitudes towards exercise settings may vary as a function of the individual's exercise experience. Hausenblas and Martin (1999), however, reported that frequent exposure to an exercise setting did not diminish SPA among experienced aerobic instructors. Therefore, the equivocal nature of the relationship between SPA and exercise experience persists. Nevertheless, given the well established importance of exercise motives and attitudes for

both the adoption and maintenance of a physically active lifestyle (Dishman & Buckworth, 1998), further inquiry of the influence of SPA on determinants of exercise participation is warranted.

Despite evidence linking SPA with antecedents of exercise behavior, knowledge of the extent to which SPA may impact the psychological consequences of exercise participation is limited. In one of the few studies addressing this issue, McInman and Berger (1993) examined the self-concept and mood state responses of 75 college females with high or low levels of SPA following an acute bout of aerobic dance. The results indicated that the aerobic dance session was associated with improvements in both self-concept and mood and these beneficial changes were demonstrated independent of the participants' SPA level. Although the findings of McInman and Berger (1993) suggest that SPA does not moderate the psychological consequences of acute exercise, results from a recent investigation revealed that females with high SPA reported lower self-efficacy in a self-presentational exercise environment (Katula, McAuley, Mihalko, & Bane, 1998). Katula and colleagues (1998) concluded that certain aspects of the exercise environment, such as the presence of mirrors, may increase the likelihood of self-presentational concerns. Thus, SPA may contribute to decrements in self-efficacy and subsequently serve as a disincentive for exercise behavior. However, research examining the influence of SPA on the psychological consequences of acute exercise remains limited and requires further exploration.

Individuals exhibiting heightened physique concerns may be motivated to seek out secluded exercise environments or abstain from exercise participation. For example, Bain,

Wilson, and Chaikind (1989) provided anecdotal support for this position in that overweight women reported anxiety associated with the prospect of being evaluated by others as the primary reason for avoiding public exercise settings. In a recent investigation, Treasure, Lox, and Lawton (1998) found empirical evidence for this assertion. High SPA was associated with lower levels of adherence to a 12 week walking program in younger, obese females. The impact of SPA upon exercise adherence was found to decrease with age leading the researchers to conclude that SPA may serve as a more potent barrier to exercise participation for younger women. Thus, it is possible that the individuals most in need of the health benefits associated with regular physical activity may be compelled to abstain from exercise participation in order to avoid the experience of SPA.

While it appears that SPA serves as a barrier to exercise participation for some individuals, findings inconsistent with this assertion have also been found. For example, Crawford and Eklund (1994) have shown high SPA to be unrelated to the self-reported frequency and duration of physical activity in female exercisers. Furthermore, Frederick and Morrison (1996) found that elevations in SPA were associated with greater frequency of exercise participation and concluded that SPA may be a motive for exercise behavior in male and female college students. Although it is unclear if SPA consistently operates as either a barrier or incentive for exercise participation, given that a majority of the aforementioned investigations relied on self-reported exercise behavior, these results must be viewed cautiously. Thus, additional research incorporating objective measures of

adherence are needed to further examine the influence of SPA on the adoption and maintenance of a physically active lifestyle.

Recent research indicates that adherence to exercise training programs may reduce SPA. In an examination of changes in body composition and SPA in middle aged males and females, McAuley and colleagues (1995) observed a significant reduction in SPA following a 20 week walking program. Reductions in SPA were more prevalent among younger females. Moreover, improvements in body composition were found to be significant predictors of reductions in SPA for younger women, but not in men. Thus, the authors concluded that physique concerns may decrease with age and physical activity may be useful for decreasing physique related concerns, particularly in young females. In a related study, changes in SPA were found to be positively related to improvements in self-efficacy and one's program related outcome expectations (i.e., improvements in weight, health, and fitness; McAuley, Bane, & Mihalko, 1995). Therefore, reductions in SPA are associated with concomitant alterations in both physical (body composition) and psychological (self-efficacy) variables (McAuley et al., 1995; McAuley, Bane, Rudolph, & Lox, 1995). However, the extent to which reductions in SPA depend upon improvements in anthropometric or psychological factors is unclear.

In summary, SPA has been shown to interact with the socially evaluative nature of the exercise environment to influence the psychosocial antecedents of exercise behavior. The degree to which SPA may impact the positive physical and psychological consequences of exercise participation is unknown. Therefore, additional inquiry

examining the influence of SPA upon the affective and behavioral consequences of exercise participation is warranted.

Exercise and Psychological Well-Being

Psychological well-being is defined as a multidimensional construct comprised of both emotional functioning and satisfaction with life (Gauvin & Spence, 1996). Disturbances in psychological well-being have been linked with deleterious effects upon both physical health and perceived quality of life (Cohen, Tyrell, & Smith, 1991). The statistics regarding psychological well-being in the United States suggest that mental illness represent a major public health problem in today's society (American Psychological Association [APA], 1994). It is estimated that 10-25% of women and 6-12% of men suffer from major depression while nearly 10-20% of the population have an anxiety disorder (APA, 1994).

Physicians have a number of strategies to treat mood disturbance (e.g., psychotherapy and pharmacologic therapy). However, some individuals do not tolerate these standard treatments well and it has been estimated that nearly 20% of those with psychological disorders receive no treatment at all (Raglin, 1997). Thus, in accordance with the pandemic nature of mental illness, substantial interest has emanated in the identification of effective alternative forms of primary and secondary prevention. One such alternative, physical activity, has been advocated as an efficacious treatment strategy for the improvement and maintenance of psychological well-being (see Morgan, 1997). Chronic physical activity, for example, has been associated with the improvements in trait anxiety and depression (Byrne & Byrne, 1993; Petruzzello, Landers, Hatfield, Kubitz, &

Salazar, 1991; Rejeski & Thompson, 1993). Recent evidence, however, indicates that reliable improvements in negative psychological traits following exercise training are moderated by one's psychological well-being at the outset of the physical activity program (North, McCullough, & Tran, 1990; Raglin, 1997). Therefore, it is unlikely for individuals characterized by good emotional health to demonstrate pronounced changes in psychological traits following chronic physical activity interventions (Raglin, 1997).

In contrast to the findings addressing chronic exercise training programs, acute bouts of exercise have been associated with positive changes in affective states regardless of initial levels of psychological well-being (Morgan, 1997). The consistent observation of psychological benefits following acute exercise led Gauvin and Rejeski (1993) to suggest that it may be the "changes experienced during repeated exposure to activity, as opposed to long term training adaptations, that are responsible for certain improvements in mental health" (p. 403). Moreover, the affective states experienced during and following acute bouts of exercise may function as potent determinants of both the adoption and maintenance of a physically active lifestyle (Dishman & Buckworth, 1998; Rejeski, 1994). Not surprisingly, the impact of acute bouts of physical activity upon more labile aspects of psychological well-being (e.g., state anxiety and mood states) has received increased attention recently (Gauvin & Spence, 1996).

Mounting evidence suggests that acute bouts of aerobic exercise are consistently associated with reductions in the negative psychological states of anxiety, depression, and cardiovascular reactivity to psychosocial stress (Crews & Landers, 1987; North et al., 1990; Raglin, 1997). Research, however, examining changes in positive dimensions of

psychological well-being is limited (Gauvin & Spence, 1996). The scant research examining the positive psychological consequences of exercise have detected increases in the perception of subjective feeling states (Bozoian, Rejeski, & McAuley, 1994; Gauvin & Rejeski, 1993; Gauvin et al., 1996). For example, improvements in perceptions of energy, revitalization, and positive engagement were detected following aerobic exercise in female college students (Bozoian et al., 1994). The findings of Bozoian et al. (1994) also revealed that high self-efficacy was associated with improvements in positive affect during and following exercise. Thus, the effect of exercise on positive affective states may be partially mediated by one's initial level of self-efficacy. Additionally, improvements in positive affect may be influenced by the exercise environment. For example, Gauvin and Rejeski (1993) found greater improvements in positive affect (e.g., revitalization and positive engagement) were exhibited during acute exercise in a naturalistic environment compared to a laboratory setting. Furthermore, Gauvin et al. (1996), using an in-situ monitoring technique with a sample of community women, also observed improvements in both positive affect and feeling states following acute bouts of exercise performed in the naturalistic setting.

In summary, findings from the research examining positive affective states suggest that acute exercise is associated with improvements in feelings of energy, revitalization, and positive affect (Bozoian et al., 1994; Gauvin & Rejeski, 1993; Gauvin et al., 1996). Moreover, the observation of elevations in positive psychological states may be dependent upon the social context of the exercise environment. It is reasonable to hypothesize that improvements in positive affect would be accompanied by reductions in negative

psychological states. Few studies, however, have examined positive and negative psychological consequences simultaneously (Gauvin et al., 1996). Therefore, additional inquiry is necessary to delineate the relationship between the social context of the exercise environment and improvements in positive and negative psychological states following bouts of acute exercise.

Proposed Mechanisms

In spite of the considerable empirical evidence linking exercise with improved psychological well-being, a comprehensive understanding of the mechanisms which contribute to these observed changes continues to be elusive (Morgan, 1997). Although a variety of psychosocial (Rejeski, 1994), cognitive (Long, 1993), and biochemical (Dishman, 1994) models have been proposed, empirical support for a single explanatory model is still absent. Compelling evidence, however, for two cognitive based explanations, self-efficacy theory (Bandura, 1997) and the distraction hypothesis (Bahrke & Morgan, 1978), has emerged in recent research (Breus & O'Connor, 1998; Katula, Blissmer, & McAuley, 1999; McAuley, Talbot, & Martinez, 1999; Treasure & Newberry, 1998; Youngstedt, O'Connor, Crabbe, & Dishman, 1998).

The Distraction Hypothesis

Developed from the serendipitous observation of equivalent anxiolytic effects following acute bouts of exercise, meditation, and quiet rest (Bahrke & Morgan, 1978), the distraction hypothesis posits that the diversion from one's daily worries provides affective benefits. This contention is consistent with the conceptual underpinnings of self-awareness theory (Duval & Wicklund, 1972) which suggests that self-focus causes

increased awareness of one's internal emotional state and therefore heightens the potential for dysphoric mood (Gibbons, 1990). Empirical support for the distraction hypothesis is evident in an investigation by Nolen-Hoeksema and Morrow (1993) who demonstrated that patients employing an eight minute distraction technique experienced a significant reduction in depression. In contrast, patients who focused their attention on current feeling states exhibited a significant elevation in depression. Thus, when applied within a behavioral therapy context, the distraction hypothesis suggests that time away from daily stressors acts as the putative agent for the "quieting response" frequently documented following acute bouts of exercise and relaxation (Bahrke & Morgan, 1978).

In addition to improvements in self-reported anxiety, decreases in physiological markers of anxiety have also been documented following exercise and relaxation interventions. For example, reductions in systolic blood pressure, a well accepted physiological indicant of anxiety (Raglin, 1997), have been found to consistently correspond with decrements in state anxiety following acute bouts of exercise and quiet rest (O'Connor & Davis, 1992; Raglin & Morgan, 1987; Raglin, Turner, & Eksten, 1993; Youngstedt et al., 1998). In one of the first experiments to document this relationship, Raglin and Morgan (1987) observed comparable reductions in state anxiety and systolic blood pressure following acute bouts of aerobic exercise and quiet rest. Although reductions in systolic blood pressure emerged following both conditions, the hypotensive response was found to persist longer following exercise. Raglin and Morgan (1987) speculated that the influence of exercise on various physiological systems produces more sustained reductions in biological markers of anxiety. In accordance with this contention,

similar findings have also been reported in recent research (Breus & O'Connor, 1998; Youngstedt et al., 1998).

In summary, the consistent observation of reductions in state anxiety following exercise and quiet rest suggest that the distraction hypothesis remains a tenable explanation for the realization of psychological benefits of exercise (Breus & O'Connor, 1998; Raglin & Morgan, 1987; Youngstedt et al., 1998). Furthermore, the demonstration of concomitant hypotensive responses has led many researchers to suggest that the mechanisms which regulate changes in blood pressure following acute bouts of exercise and quiet rest may be related to reductions in state anxiety following behavioral therapy interventions (Breus & O'Connor, 1998; Raglin & Morgan, 1987; Raglin et al., 1993; Youngstedt et al., 1998).

Self-Efficacy Theory

Although the distraction hypothesis remains a tenable explanation for exercise-induced affective benefits, other theoretical positions have also emerged. Perhaps the most widely accepted of these alternatives is self-efficacy theory. Self-efficacy, the primary construct within social cognitive theory, refers to one's belief in his or her capabilities to successfully satisfy situational demands and produce desired outcomes (Bandura, 1997; McAuley & Mihalko, 1998). Bandura (1997) has theorized that self-efficacy beliefs influence the behavior an individual chooses to participate in, as well as the amount of effort one will expend while engaged in the behavior. Self-efficacy mediates emotional responses to a wide variety of behaviors. Specifically, poor perceptions of self-efficacy have been associated with increased anxiety and may facilitate the demonstration

of avoidant behaviors (Bandura, 1997).

Despite the established link between self-efficacy and psychological well-being, few studies have examined the moderating role of self-efficacy in the relationship between exercise and psychological well-being. McAuley and Courneya (1992) found that sedentary adults with high self-efficacy experienced greater improvements in affect during a graded exercise test when compared to less efficacious individuals. Positive affect during the exercise test was found to predict improvements in post-exercise psychological well-being and this relationship was strengthened after the results of the exercise test were explained to the participant. These findings were replicated and extended to a sample of female college students by Bozoián and her colleagues (1994) who observed that high self-efficacy was associated with increases in the perception of revitalization and positive engagement during and following an acute bout of stationary cycling.

While these findings suggest that self-efficacy moderates the exercise-affect relationship, recent research indicates that the demand of the exercise bout may influence the strength of the association between self-efficacy and psychological well-being. In an investigation of the relationship between self-efficacy and affect during bouts of cycle ergometry of different intensities (i.e., 45-50% and 70-75% of age related heart rate maximum), Treasure and Newberry (1998) found that self-efficacy only predicted feelings of exhaustion during the most intense condition. The authors concluded that, consistent with social cognitive theory, the strength of the self-efficacy affect relationship is most robust when the activity provides a sufficient challenge (Bandura, 1997).

In summary, despite increased interest in delineating the mechanisms responsible for exercise induced improvements in psychological well-being, the causal agents underlying the psychological beneficence of exercise are not known at the present time. As a result, improvements in psychological states cannot be directly attributed to any single explanatory model. Nevertheless, prior research suggests that both self-efficacy theory and the distraction hypothesis are tenable explanations for the psychological beneficence of exercise (Breus & O'Connor, 1998; McAuley et al., 1999). Further inquiry addressing the distraction hypothesis and self-efficacy theory in the exercise-affect relationship is warranted.

The Dose-Response Perspective

Although criteria have been developed regarding the minimal dose of exercise necessary for derivation of physical health benefits (United States Department of Health and Human Services [USDHHS], 1996), similar guidelines pertaining to the amelioration of psychological well-being do not exist. Thus, while exercise is associated with improvements in psychological well-being, the programmatic factors which may hasten the realization of these benefits are not known. Given that the identification of the optimal therapeutic dose of exercise for psychological benefits possesses both applied and theoretical relevance (Morgan, 1997; Rejeski, 1994), further delineation of the dose-response effects of acute exercise on psychological well-being is needed.

The majority of investigations addressing the dose-response issue have examined the role of intensity on the psychological consequences of acute bouts of exercise (Rejeski, 1994). However, findings from this line of inquiry remain equivocal (Dishman &

Buckworth, 1998; Morgan, 1985; Raglin, 1990). For example, results from one of the earliest investigations of this relationship indicated that improvements in psychological states were only observed following vigorous bouts of exercise (Morgan, Roberts, & Finerman, 1971). Although subsequent investigations (Bulbulian & Darabos, 1986; Tate & Petruzzello, 1995) have provided support for the conclusions of Morgan et al. (1971), the findings of Berger and Owen (1992) and Steptoe and Cox (1990) suggest that intense bouts of exercise are associated with increases in mood disturbance. Thus, some researchers propose that psychological well-being is optimized by less intense bouts of exercise (Berger & Owen, 1992; Rejeski, 1994; Steptoe & Cox, 1990).

It is possible, however, that methodological differences among the aforementioned studies may contribute to the prevailing ambiguity. For example, Raglin and Wilson (1996) documented different temporal sequences for reductions in state anxiety following light, moderate, and high intensity bouts of cycling. Findings indicated that while reductions in state anxiety were observed at each post-exercise assessment following the light and moderate intensity conditions, state anxiety was increased immediately after the high intensity bout. However, an anxiolytic effect comparable to those observed following the light and moderate intensity bouts was found to emerge 60 min after the high intensity bout as well. Raglin and Wilson (1996) concluded that the increased physiological demand associated with high intensity exercise sessions may act to delay anxiolytic benefits. Therefore, since negative feeling states observed immediately following acute exercise are transient in nature and often short lived, the proximity of the post-exercise assessment intervals to the cessation of activity may serve as a moderating variable for the

observation of psychological benefits (O'Connor, Petruzzello, Kubitz, & Robinson, 1995).

While several studies have explored the influence of exercise intensity upon psychological consequences (Berger & Owen, 1992; O'Connor et al., 1995; Raglin & Wilson, 1996; Steptoe & Cox, 1990; Tate & Petruzzello, 1995; Treasure & Newberry, 1998), few investigations have examined the potential impact of exercise duration on post-exercise psychological responses. Results from meta-analytic reviews suggest that the most prominent anxiolytic effects were observed following bouts of exercise which lasted 20 min or longer (Petruzzello et al., 1991; Schlicht, 1994). Some investigations, however, have found that brief bouts of exercise may also be beneficial for psychological well-being. Thayer (1987) contrasted the influence of a 10 min walk with the consumption of a sugar snack on affect and anxiety. An increase in the perception of energy and reduction in anxiety were detected following the walking bout, while the sugar snack condition was associated with an increase in both fatigue and anxiety. In an examination of the influence of exercise duration on anxiety, Petruzzello and Landers (1994) reported equivalent reductions in state anxiety following both 15 and 30 min bouts of treadmill running.

Recent findings suggest that improvements in positive affect also emerge following short duration bouts of exercise (Ekkekakis, Hall, VanLanduyt, & Petruzzello, 1999; Hall, Ekkekakis, & Petruzzello, 1999; He & Landers, 1998; Rudolph & Butki, 1998). Rudolph and Butki (1998) demonstrated that increases in positive affect and self-efficacy observed following 10 min of treadmill running were equivalent to changes exhibited after episodes lasting 15 and 25 min. Findings from unpublished reports corroborate the assertion that 10 min of aerobic exercise is associated with reliable increases in positive affect

(Ekkekakis et al., 1999; Hall et al., 1999; He & Landers, 1998). Nevertheless, these results also suggest that such improvements are transient and short-lived.

The inconsistent findings evident in the literature have precluded the development of a consensus regarding the dose-response relationship between exercise and psychological well-being. Specifically, while research incorporating manipulations of exercise intensity or duration has provided an adequate foundation for further inquiry, a holistic approach to the examination of the dose-response effects of exercise and affect is still absent. In his seminal review of the dose-response perspective, Rejeski (1994) attempted to provide an explanation for this prevailing ambiguity.

First, the current conceptualization of the dose-response perspective is complex and reductionistic. Although the classic conceptualization of the dose-response perspective can be linked to the study of drug therapy interventions, such an approach is unlikely to be successful in the examination of psychological responses to exercise. Both the intricate interaction of the social, biological, and psychological variables, as well as the breadth of potential outcomes, provides compelling evidence against the likelihood that dose-response effects can be reduced to any single system. Therefore, manipulation of a single programmatic factor (e.g., intensity or duration) without simultaneously addressing any social, biological, or psychological antecedents is unlikely to provide insight regarding the dose-response effects of exercise. Thus, Rejeski (1994) contends that it would be more advantageous to examine the psychological responses following acute exercise within a psychosocial framework because any observable dose-response effects will result

not from manipulation of a single factor, but from a unique interaction of social, physiological, and psychological variables.

Second, Rejeski states that much of the research originated within the confines of an inflexible stimulus response paradigm which designates the exerciser as a passive agent. This paradigm fails to acknowledge that each individual actively interprets the variables which comprise a given dose of exercise. The importance of the interpretation of a stimulus has been well established within widely accepted theoretical models of stress (Lazarus & Opton, 1966; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983). Therefore, further understanding of the factors which influence the perceiver's phenomenology for interpreting a given dose of physical activity is needed to elucidate the complex interaction that determines the resultant dose-response effects (Rejeski, Gauvin, Hobson, & Norris, 1995).

Finally, it is possible that the dose-response effects of exercise vary as a function of either the psychological outcome or population under examination. Consequently, the heterogeneity of participants, affective responses, and psychological measures included in previous research may have contributed to inconsistencies evident in the dose-response perspective. Thus, Rejeski (1994) concluded that because much of the literature has failed to examine the dose-response effects of exercise from the interactionist perspective, knowledge regarding the social psychobiological factors which influence the perceiver's interpretational phenomenology is sparse.

The extent to which this lack of understanding may hinder the ecological validity of prior research examining psychological beneficence of exercise also remains unclear.

For example, previous investigations suggest that the exercise environment may serve as a cogent determinant of in-task psychological states (McAuley, Mihalko, & Bane, 1996; Turner, Rejeski, & Brawley, 1997). These findings have led some researchers to suggest that the exercise environment may be the most salient determinant of the perceptual and affective responses to an acute bout of exercise (McAuley et al., 1996; Rejeski, 1994; Turner et al., 1997). Nevertheless, a substantial portion of the exercise-affect research has been conducted within sterile laboratory settings. While use of this methodology provides increased experimental control, it has also been purported to represent a limitation of the dose-response literature. Specifically, some researchers contend that a laboratory setting fails to capture the rich social environment which may contribute to the amelioration of various aspects of psychological well-being (Gauvin & Rejeski, 1993; Gauvin et al., 1996).

Moreover, the exercise intensities often prescribed to participants within dose-response studies (i.e., 60% or 80% of maximal aerobic capacity) are not indicative of the level of exertion individuals select during their own habitual exercise participation (Dishman, 1994; Farrell, Gates, Maksud, & Morgan, 1982; Gauvin et al., 1996; Turner et al., 1997). Additionally, there is evidence that self-selected exercise intensity may moderate improvements in psychological well-being following acute aerobic exercise (Dishman, Cureton, & Farquar, 1994; Pasley & Janelle, 1999). Therefore, due to the use of sterile laboratory environments and arbitrarily determined exercise characteristics, the extent to which much of the dose-response literature can be generalized to typical exercise behaviors is limited.

In summary, the majority of the research examining the relationship between exercise and psychological well-being has failed to acknowledge the holistic nature of the interactionist perspective. Knowledge of the factors which may moderate the relationship between exercise and psychological well-being is limited. It also remains unclear how positive affective responses are related to concomitant alterations in negative psychological states (e.g., anxiety) or physiological markers of stress (e.g., systolic blood pressure). Therefore, additional research elucidating the association between psychosocial antecedents and environmental factors as well as its subsequent influence upon the psychobiological responses following acute exercise is warranted.

Social Physique Anxiety and Psychological Consequences of Exercise

Rejeski (1994) contends that the realization of exercise induced affective benefits is mediated by a complex interaction of social, biological, and psychological factors. Thus, an individual's psychological disposition interacts with the environmental and programmatic characteristics of an exercise session to influence his or her perceptual and affective responses to an acute bout of physical activity. Consequently, dispositional variables may moderate exercise related improvements in psychological states (Gauvin et al., 1996; Rejeski et al., 1995). Consistent with this position, Morgan (1997) has stated that it would be prudent from a conceptual standpoint to utilize psychological traits as predictor variables of changes in psychological states following acute bouts of exercise. Few studies, however, have examined the influence of potential moderator variables (Gauvin & Spence, 1996). Furthermore, moderator variables which have been examined (i.e., fitness level or gender) have not been developed within a theoretical framework and

failed to acknowledge the interactionist perspective (Rejeski & Thompson, 1993). Therefore, knowledge of the role of dispositional variables within the exercise-affect relationship is limited (Gauvin & Spence, 1996).

It is possible that SPA represents a dispositional variable which acts as a salient determinant of psychological responses to exercise. Consistent with self-presentational theory (Leary, 1983; Schlenker, 1980), individuals with high SPA report increased stress and decreased self-efficacy in exercise environments (Hart et al., 1989; Katula et al., 1998). Thus, SPA influences one's in-task psychological states. Given that the subjective states experienced during acute bouts of exercise may serve as potent determinants of post-exercise affective states (Gauvin & Rejeski, 1993; Rejeski, 1994), it is reasonable to suggest that an individual's SPA level may interact with the environmental, social, and programmatic characteristics of exercise to influence his/her post-exercise affective responses. In the aforementioned study by McInman and Berger (1993) it was found that improvements in self-concept and mood following an aerobic dance class did not vary as a function of SPA. However, these results should be interpreted cautiously due to the use of a quasi-experimental research design, the failure to quantify the individuals' SPA level until after the exercise session, and the use of a median split to compare low and high SPA groups. Therefore, several questions persist regarding the extent to which SPA may moderate the affective consequences of exercise.

Provided that the exercise environment represents a socially evaluative setting with ample opportunity for physique evaluation (Leary, 1992), it is possible that exposure to a public exercise setting may be associated with increased mood disturbance in women

with high SPA. Furthermore, since distraction from daily stress has been proposed to serve as the putative mechanism underlying improvements in psychological states following exercise (Bahrke & Morgan, 1978), it is reasonable to suggest that an exercise session in a public setting may not provide high SPA individuals with adequate distraction from daily worries in order to derive such psychological benefits.

The contention that psychological states experienced during and following acute bouts of exercise are determinants of continued exercise participation (Rejeski, 1994) suggests that the influence of SPA on affective responses may also have implications for health behavior. Specifically, when considering the well established relationship between the sedentary lifestyle and all-cause mortality (USDHHS, 1996), findings which contribute to a greater understanding of the factors which influence exercise adherence are of paramount importance within a public health context. Hence, further examination of the influence of SPA upon psychological responses to exercise could assist in elucidating the role of SPA in exercise behavior. Therefore, in light of the potentially deleterious impact of self-presentational concerns upon health behaviors, additional exploration of the relationship between SPA and psychological responses to acute exercise is warranted.

Statement of the Problem

The primary purpose of the pilot study was to examine the influence of SPA on changes in selected psychobiological responses following acute bouts of aerobic exercise and quiet rest in females. Three hypotheses were investigated. First, due to the socially evaluative nature of naturalistic exercise environments, it was hypothesized that improvements in psychological states would only emerge following the quiet rest

condition for individuals with high SPA. Second, it was hypothesized that improvements in psychological states would be observed following both exercise and quiet rest in low SPA participants. Finally, it was hypothesized that reductions in blood pressure would accompany improvements in psychological states for both high and low SPA participants.

CHAPTER TWO
PILOT STUDY:
SOCIAL PHYSIQUE ANXIETY AND PSYCHOBIOLOGICAL RESPONSES
FOLLOWING ACUTE BOUTS OF AEROBIC EXERCISE AND QUIET REST

Previous research has demonstrated that individuals with elevations in SPA report increased stress and body dissatisfaction in evaluative situations (Hart et al., 1989). The prominence of the body during physical activity suggests that the exercise environment represents a setting in which physique related self-presentational concerns would be prevalent (Leary, 1992). Given that physical activity settings are replete with the potential for negative physique evaluation, it is possible that exposure to the exercise environment may provoke dysphoric mood in high SPA individuals. Thus, it is plausible that excessive levels of SPA may preclude some individuals from obtaining the affective benefits typically observed following acute bouts of exercise.

Few investigations, however, have been conducted to examine this assertion (McInman & Berger, 1993) and the extent to which SPA may moderate the psychological beneficence of exercise remains unknown. Furthermore, much of the prior research examining the psychological consequences of acute exercise have focused predominately on self-reported changes in negative psychological states. Consequently, the limited knowledge of how positive affective responses are related to concomitant alterations in

negative psychological states (e.g., anxiety) or physiological markers of stress (e.g., blood pressure) continues to persist. In order to examine these aforementioned issues, the primary purpose of the pilot study was to contrast the efficacy of acute bouts of aerobic exercise and quiet rest on the amelioration of positive and negative psychological states and blood pressure responses in females with high or low levels of SPA.

Method

Participants

Fifty female university students (M age = 19.9 years, SD = 1.6; 92% Caucasian) were recruited to participate in the study. A female sample was employed based on findings within previous research suggesting that intensity and direction of SPA differs as a function of gender (Hart et al., 1989; Petrie et al., 1996).

Measures

Social Physique Anxiety Scale (SPAS). SPA was assessed using the nine-item SPAS which is a trait measure of one's self-presentational anxiety regarding the appearance of his or her physique (Martin, Rejeski, Leary, McAuley, & Bane, 1997). Participants indicated the degree to which each item was characteristic of them on a 5-point likert scale. SPAS scores range from 9 (low) to 45 (high). Research has found the 9-item SPAS to demonstrate acceptable divergent validity and adequate internal consistency (Hausenblas & Martin, 1999; Martin et al., 1997). Consistent with these findings, the SPAS exhibited acceptable internal consistency in the present sample (α = .86).

State-Trait Anxiety Inventory (STAI). State anxiety was measured using Form Y-1 of the STAI which assesses the cognitive aspects of state anxiety (Spielberger et al., 1983). The STAI has undergone rigorous validation procedures and has been shown to demonstrate convergent, divergent, and construct validity as well as adequate internal consistency (Gauvin & Spence, 1998; Spielberger et al., 1983). Consistent with these findings, the SPAS exhibited acceptable internal consistency within the present sample ($\alpha = .86$).

Exercise Induced Feeling Inventory (EFI). The EFI is a 12-item multidimensional affective measure that assesses the extent to which participants experience four distinct feeling states: positive engagement, revitalization, tranquility, and physical exhaustion (Gauvin & Rejeski, 1993). The EFI has been shown to exhibit convergent and divergent validity as well as acceptable internal consistency (Gauvin & Rejeski, 1993; Gauvin et al., 1996; Gauvin & Spence, 1998). The EFI also demonstrated adequate internal consistency within the present sample with alpha values exceeding .86 for each subscale.

Leisure-Time Exercise Questionnaire (LTEQ). The LTEQ measures the self-reported frequency of strenuous, moderate, and mild bouts of exercise during the course of a typical week (Godin & Shephard, 1985). LTEQ subscale scores are converted into metabolic equivalents (METs; mild $\times 3$ + moderate $\times 5$ + strenuous $\times 9$) and summed to provide an estimate of total METs expenditure from exercise for an average week. Previous research has shown that the LTEQ possesses adequate reliability and validity (Jacobs, Ainsworth, Hartman, & Leon, 1993).

Ratings of Perceived Exertion (RPE). In order to quantify the participants' overall effort sense during the exercise session, RPE were obtained using Borg's 6 - 20 scale (1973). RPE has been conceptualized as a psychobiological configuration of sensations associated with the perception of effort during exercise and has been used extensively in previous exercise psychology research. The original 6-20 version of the RPE scale has been shown to demonstrate concurrent, predictive, and construct validity as well as adequate test-retest reliability (Borg, 1998).

Blood pressure. Blood pressure measurements were obtained using the Omron Model HEM-725C automated digital blood pressure monitor (Country Technology Inc., Gays Mills, WI). The Omron monitor provides an accurate assessment of blood pressure through the utilization of the oscillometric detection method which converts the measurement of the blood's movement through the brachial artery into a digital readings of systolic and diastolic blood pressure.

Body composition. Two measures of body composition were obtained. First, percent body fat was assessed with skinfold calipers using the three site technique (i.e., triceps, suprailiac, & quadriceps; Jackson, Pollock, & Ward, 1980). The average of the three skinfold measurements obtained from each site were converted to an estimate of body composition using the generalized equations developed by Jackson et al. (1980). Second, body mass index (BMI) was calculated from direct height and weight assessments. BMI has been suggested to serve as a more effective measure of nutritional and health status (i.e., under or overweight) than standard weight tables (Hausenblas & Mack, 1999).

Caloric expenditure. In order to document total energy expenditure during the exercise condition, caloric expenditure was recorded from the digital monitors on the cycling, rowing, or stair-climbing machines utilized by the participants.

Procedures

Prior to participation, each volunteer read and signed an informed consent document that had been approved by the University of Florida's Institutional Review Board. Upon completion of the study requirements, all volunteers received class extra credit for their participation. In order to determine eligibility for inclusion in the experiment, all volunteers completed the SPAS prior to participation in order to stratify the sample into high and low SPA groups. Only volunteers scoring 36 or above (high SPA group) or 22 or below (low SPA group) were eligible to participate in the experiment. The SPAS values for high and low group eligibility were determined based on average SPAS scores of college age females reported in previous research (Hausenblas & Martin, 1999; Martin et al., 1997). Participants meeting the eligibility requirements for the high ($n = 25$) and low SPA ($n = 25$) groups were requested to complete 20 min episodes of aerobic exercise and quiet rest. Episodes were completed at approximately the same time (i.e., 11 a.m. to 2 p.m.) on separate days and the order of each condition was randomly assigned and presented in a counterbalanced fashion. Assessments of state anxiety, affect, and blood pressure were obtained immediately prior to as well as immediately and 30 min following each condition.

In an attempt to standardize the attire during each condition and attenuate the potential use of clothing as part of protective (loose, baggy attire) or acquisitive (tight,

more revealing attire) self-presentational strategies, participants were requested to wear a t-shirt and pair of shorts to each session. Prior to the beginning of the initial session, participants also completed the LTEQ and a medical history questionnaire. Upon arrival at the laboratory, participants completed the baseline assessments of the STAI and EFI. During both the exercise and quiet rest conditions, blood pressure was assessed immediately following the completion of the psychological questionnaires at each of the pre- and post-condition assessment intervals. Blood pressure measurements were taken twice consecutively in a seated position with the average of the two measurements recorded as the criterion score. To minimize the potential influence of demand characteristics or expectancy effects, participants were only informed of which condition they would be performing during a particular session following the completion of the baseline STAI, EFI, and blood pressure assessments.

Exercise condition. Exercise sessions were conducted at a university fitness facility located directly adjacent to the exercise psychology laboratory. Participants were escorted to the fitness facility by a laboratory assistant and instructed to perform 20 min of exercise at a preferred level of exertion on the a piece of aerobic exercise equipment of their choice (i.e., cycling, rowing, or stairmaster machines). Participants were instructed to record their RPE and total caloric expenditure provided by the machine's digital monitor at the conclusion of the session. Immediately following the completion of the 20 min exercise condition, all participants returned to the exercise psychology laboratory and sat quietly in a room free of distractions for the next half hour during which time the

immediate and 30 min post-exercise assessments of the dependent measures were obtained.

The rationale for the procedure was twofold. First, in order to assess the relationship between SPA and psychological responses to exercise it was necessary to conduct the exercise condition within an environment possessing the prospect for physique evaluation. The fitness center was a naturalistic exercise setting which provided ample opportunity for the realization of self-presentational concerns via the constant presence of recreational exercisers, staff members, and mirrored walls. Second, permitting participants to exercise while utilizing their preferred mode and level of exertion within a naturalistic exercise environment provided a more ecologically valid assessment of the influence of SPA on psychobiological responses following acute exercise.

Quiet rest condition. During the quiet rest session participants sat quietly for 20 min in a room free of distractions within the exercise psychology laboratory. Participants were not provided with any specific instructions beyond being requested not to sleep or work during the session. Following the conclusion of the quiet rest session, the assessments of height, weight, and body composition were obtained. The potential influence of this evaluation on the dependent measures was addressed by instructing participants at the outset of the study that they may receive a body composition assessment if they so desired. Each participant was given this option following the quiet rest condition and all volunteers agreed to participate in the evaluation.

Analysis

The sample size employed resulted in a power which exceeded .90 for the main effects and .80 for the interaction effects of interest for the analyses conducted (Potvin & Schutz, 1996). Consistent with previous research (Bozoian et al., 1994; Rejeski et al., 1995), data were analyzed with separate $2 \text{ (SPA)} \times 2 \text{ (Condition)} \times 3 \text{ (Time)}$ mixed model multivariate analysis of variance (MANOVA) with repeated measures on the last two factors. The two levels of the SPA factor represent the high and low SPA groups. The two levels of the condition factor represent the exercise and quiet rest conditions. Finally, the three levels of the time factor represent the assessment intervals for the primary dependent measures immediately prior to and immediately and 30 min following each condition. State anxiety and the subscales of the EFI (positive engagement, revitalization, tranquility, and physical exhaustion) served as the dependent measures of the first MANOVA and systolic and diastolic blood pressure served as the dependent measures in the second MANOVA. Univariate analysis of variance (ANOVA) with Bonferroni adjustments were employed for follow-up analyses and Tukey's post-hoc tests were used to determine the location of mean differences when significant effects were detected. In order to address the potential influence of baseline measurements, the analyses were also conducted on the data expressed as change scores consistent with recommendations by Huck and McLean (1975). Since the baseline measure does not contribute to the variation detected across time, analysis of change scores yields the same results as an ANCOVA analysis of the raw data when the assumptions of sphericity are met. The observation of epsilon values which exceeded .75 for all analyses conducted confirm its use was

appropriate within the present study. Effect sizes (ES) were calculated to examine the magnitude of the changes across time for each of the dependent measures. Differences among the SPA groups in mild, moderate, strenuous, and total LTEQ scores were analyzed with separate one-way ANOVA's with alpha adjustments ($p < .012$). Independent t-tests with alpha adjustments ($p < .01$) were used to analyze differences among the SPA groups in percent body fat, BMI, RPE, and caloric expenditure.

Results

Demographic Characteristics. Consistent with previous research (Hart et al., 1989), high SPA participants had significantly higher percent body fat, $t(48) = 4.65$, $p < .001$, and BMI, $t(48) = 4.91$, $p < .001$, compared to the low SPA participants. No significant differences between the high and low SPA groups were observed for mild, $F(1, 49) = 3.85$, $p > .06$, moderate, $F(1, 49) = .05$, $p > .81$, strenuous, $F(1, 49) = .44$, $p > .51$, or total LTEQ scores, $F(1, 49) = .02$, $p > .89$. Furthermore, no significant differences in RPE, $t(48) = 2.0$, $p > .05$, or caloric expenditure, $t(48) = .88$, $p > .38$, were found between the high and low SPA groups during the exercise session. Therefore, the high and low SPA groups did not differ on involvement in exercise during a typical week or energy expenditure and perception of effort during the exercise condition (see Table 2.1 for descriptive statistics).

Psychological State Variables. The MANOVA with SPA as the between subjects factor, Condition and Time as the within subjects factors, and the STAI and EFI scores as the dependent measures revealed significant main effects for Time, Wilks' lambda = .71, $F(5, 92) = 7.37$, $p < .001$,

Table 2.1

Means (M) and Standard Deviation (SD) Scores of the Demographic Characteristics for the High and Low Social Physique Anxiety Groups.

Variable	High SPA ($n = 25$)	Low SPA ($n = 25$)
	M (SD)	M (SD)
Social Physique Anxiety	39.0 (2.7)	18.0 (3.0)
Percent Body Fat	22.8 (2.5)*	19.2 (2.8)
Body Mass Index	24.1 (2.9)*	20.9 (1.5)
Caloric Expenditure	157.3 (37.2)	147.6 (39.9)
Ratings of Perceived Exertion	13.2 (1.5)	14.0 (1.5)
Leisure-Time Exercise Questionnaire		
Mild	6.8 (7.3)	3.4 (5.1)
Moderate	8.2 (9.1)	8.8 (8.3)
Strenuous	19.8 (10.1)	21.9 (12.7)
Total	34.8 (19.1)	34.1 (16.9)

* Significantly higher than low SPA group ($p < .001$).

and Condition, Wilks' $\lambda = .55$, $F(5, 92) = 14.83$, $p < .001$, as well as a significant Condition x Time interaction, Wilks' $\lambda = .82$, $F(5, 92) = 4.00$, $p < .002$. Follow-up univariate analyses detected that state anxiety and the positive engagement, revitalization, and tranquility subscales of the EFI were responsible for the significant multivariate effects. No significant effects were detected for physical exhaustion (see Table 2.2). First, a significant main effect for Time was observed for state anxiety, $F(1, 96) = 16.06$, $p < .001$. Thus, irrespective of condition, a significant reduction in state anxiety emerged at the 30 min post-session assessment interval (see Figure 2.1). The main effect for SPA and Condition x Time interaction approached significance ($p = .06$). Examination of the ES revealed that larger reductions in state anxiety were observed following both exercise (ES post = $-.54$; ES post-30 = $-.88$) and quiet rest (ES post = $-.45$; ES post-30 = $-.58$) in the high SPA group compared to the low SPA group. Thus, while both exercise and quiet rest were associated with significant reductions in state anxiety, larger ES were exhibited within the high SPA group following each condition.

Second, in regard to positive engagement, a significant main effect for Condition, $F(1, 96) = 35.48$, $p < .001$, as well as a significant Condition x Time interaction, $F(1, 96) = 7.22$, $p < .01$, were observed. Post hoc analyses revealed that positive engagement was significantly increased immediately (ES = $.95$) and 30 min (ES = $.64$) following the exercise condition only. Additionally, the elevations in positive engagement were significantly larger than those observed following quiet rest (ES post = $.24$; ES 30 min post = $.20$; see Figure 2.2). Thus, improvements in positive engagement were only observed

Table 2.2

Means (M) and Standard Deviation (SD) Scores of the State Anxiety, Exercise-Induced Feeling States Subscales and Blood Pressure Values for the Pre, Post, and Post-30 Assessment Intervals.

Variable	Pre M (SD)	Post M (SD)	Post-30 M (SD)
<u>State Anxiety</u>			
Exercise - High SPA	38.4 (8.7)	33.9 (9.0)	31.2 (8.1)
Quiet Rest - High SPA	38.8 (11.1)	35.9 (9.3)	35.1 (10.1)
Exercise - Low SPA	29.0 (6.6)	27.8 (7.3)	24.5 (5.1)
Quiet Rest - Low SPA	27.2 (6.2)	26.2 (5.0)	24.7 (4.5)
<u>Positive Engagement</u>			
Exercise - High SPA	5.1 (2.6)	7.6 (2.9)	6.9 (2.9)
Quiet Rest - High SPA	5.5 (3.6)	5.3 (3.2)	5.2 (3.3)
Exercise - Low SPA	7.4 (2.6)	9.0 (2.8)	8.3 (3.2)
Quiet Rest - Low SPA	7.9 (2.9)	7.1 (2.7)	7.4 (2.9)
<u>Revitalization</u>			
Exercise - High SPA	3.1 (2.4)	7.5 (2.7)	6.5 (3.5)
Quiet Rest - High SPA	3.9 (3.3)	3.5 (2.9)	3.9 (3.1)

Exercise - Low SPA	4.8 (2.9)	8.4 (3.2)	7.5 (2.8)
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Quiet Rest - Low SPA	5.4 (3.4)	4.3 (2.9)	4.2 (3.0)
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Tranquility

Exercise - High SPA	5.8 (2.4)	6.6 (3.2)	7.8 (3.7)
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Quiet Rest - High SPA	6.5 (3.3)	7.4 (2.9)	7.4 (3.4)
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Exercise - Low SPA	9.3 (1.8)	8.6 (2.9)	10.0 (2.1)
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Quiet Rest - Low SPA	9.4 (2.7)	10.1 (2.1)	10.5 (2.0)
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Physical Exhaustion

Exercise - High SPA	4.4 (3.5)	3.2 (3.0)	4.0 (4.0)
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Quiet Rest - High SPA	4.9 (3.4)	4.6 (3.6)	4.4 (3.6)
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Exercise - Low SPA	4.0 (2.8)	3.1 (2.7)	4.1 (3.4)
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Quiet Rest - Low SPA	3.9 (3.2)	4.1 (2.8)	4.7 (3.8)
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Systolic Blood Pressure

Exercise - High SPA	103.9 (7.9)	110.4 (8.0)	96.4 (6.3)
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Quiet Rest - High SPA	102.3 (7.9)	98.4 (7.4)	98.7 (7.9)
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Exercise - Low SPA	105.0 (7.4)	107.4 (9.0)	97.5 (7.2)
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Quiet Rest - Low SPA	102.7 (9.2)	99.7 (9.8)	97.1 (7.2)
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Diastolic Blood Pressure

Exercise - High SPA	64.3 (8.6)	67.7 (7.2)	60.9 (7.1)
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Quiet Rest - High SPA	64.0 (5.9)	61.9 (7.2)	63.0 (6.3)
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Exercise - Low SPA	63.2 (5.0)	64.1 (4.6)	61.1 (6.7)
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Quiet Rest - Low SPA	63.1 (5.8)	64.2 (10.2)	60.4 (5.7)
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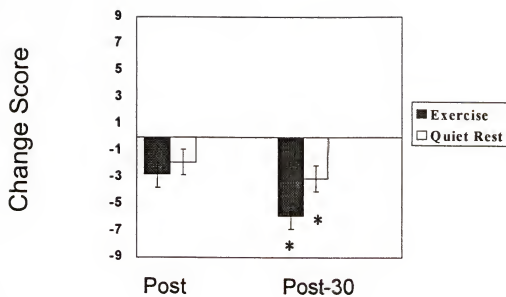


Figure 2.1. Changes in state anxiety following exercise and quiet rest

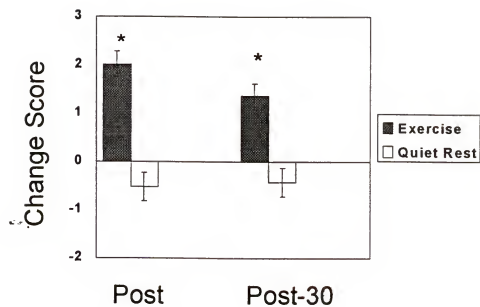


Figure 2.2. Changes in positive engagement following exercise and quiet rest

following exercise and these elevations were significantly larger than those detected following quiet rest.

Third, in regard to revitalization, a significant main effect for Condition, $F(1, 96) = 60.73$, $p < .001$, as well as a significant Condition \times Time interaction, $F(1, 96) = 14.58$, $p < .002$, were detected. Post hoc analyses revealed that significant increases in revitalization were observed immediately ($ES = 1.17$) and 30 min ($ES = .91$) following the exercise condition only. Additionally, the elevations in revitalization following exercise were found to be significantly larger than those observed following quiet rest (see Figure 2.3). Therefore, improvements in revitalization were only realized following exercise and the increases were found to be significantly larger than those found following quiet rest.

Fourth, in regard to tranquility, a significant main effect for Time, $F(1, 96) = 10.98$, $p < .001$, as well as a significant Condition \times Time interaction, $F(1, 96) = 5.90$, $p < .01$, were detected. Post hoc analyses indicated tranquility was significantly increased immediately ($ES = .35$) and 30 min ($ES = .44$) following quiet rest and 30 min ($ES = .42$) following exercise (see Figure 2.4). Thus, both exercise and quiet rest were associated with improvements in tranquility.

Physiological Variables. The MANOVA with SPA as the between subjects factor, Condition and Time as the within subjects factors, and the systolic and diastolic blood pressure values as the dependent measures revealed a significant effect for Time, Wilks' $\lambda = .53$, $F(2, 95) = 41.61$, $p < .001$, as well as significant Condition \times Time, Wilks' $\lambda = .62$, $F(2, 95) = 29.12$, $p < .001$, and SPA \times Condition \times Time, Wilks' $\lambda = .91$, $F(2, 95) = 4.95$, $p < .009$, interactions. Univariate analyses revealed that both systolic

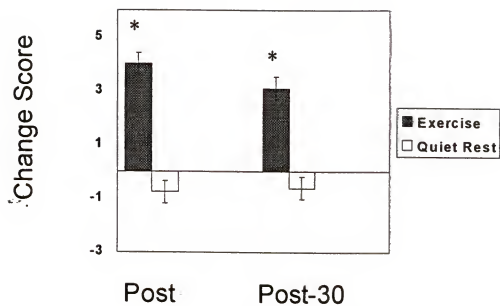


Figure 2.3. Changes in revitalization following exercise and quiet rest

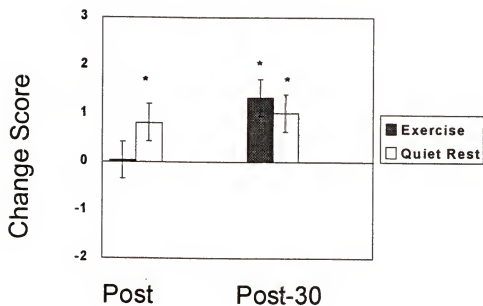


Figure 2.4. Changes in tranquility following exercise and quiet rest

and diastolic blood pressure contributed to the significant multivariate effects (see Table 2.2). First, in regard to systolic blood pressure, a significant main effect for Time, $F(1, 96) = 84.06$, $p < .001$, significant Condition \times Time, $F(1, 96) = 56.92$, $p < .001$, and a significant SPA \times Condition \times Time, $F(1, 96) = 6.28$, $p < .01$, interactions were observed. Post hoc analysis revealed that systolic blood pressure was significantly elevated ($ES = .79$) immediately following exercise in the high SPA group. Furthermore, significant reductions in systolic blood pressure were detected 30 min following both exercise ($ES = -1.10$) and quiet rest ($ES = -.63$) in the low SPA group and 30 min following only exercise ($ES = -.94$) in the high SPA group (see Figure 2.5). Therefore, significant reductions in systolic blood pressure were observed following exercise in both the high and low SPA groups. Decrements, however, in systolic blood pressure only emerged following quiet rest in the low SPA group.

Second, in regard to diastolic blood pressure, a significant main effect for Time, $F(1, 96) = 17.30$, $p < .001$, as well as significant Condition \times Time, $F(1, 96) = 5.38$, $p < .02$, and SPA \times Condition \times Time, $F(1, 96) = 8.29$, $p < .005$, interactions were detected. Post hoc analysis revealed that diastolic blood pressure increased significantly ($ES = .40$) immediately following exercise in the high SPA group. Diastolic blood pressure was also shown to be significantly decreased 30 min following exercise ($ES = -.47$) in the high SPA group (see Figure 2.6). Thus, within the high SPA group, diastolic blood pressure was

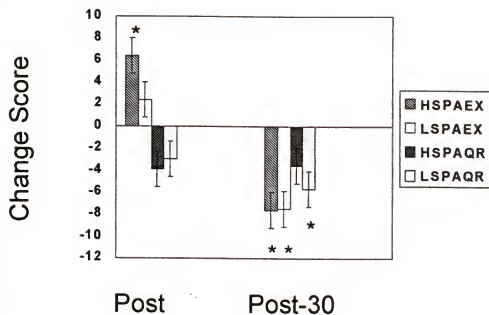


Figure 2.5. Changes in systolic blood pressure for the high and low SPA groups following exercise and quiet rest

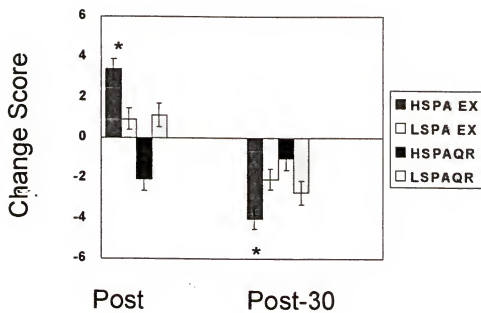


Figure 2.6. Changes in diastolic blood pressure for the high and low SPA groups following exercise and quiet rest

found to be significantly elevated immediately post-exercise and significantly reduced 30 min post-exercise.

Discussion

The primary purpose of the pilot study was to examine the psychobiological responses of females with high or low levels of SPA following acute bouts of aerobic exercise and quiet rest. It was found that aerobic exercise and quiet rest were associated with significant improvements in feeling states (i.e., positive engagement, revitalization, and tranquility) as well as reductions in state anxiety and systolic blood pressure that were observed independent of SPA level. This finding is in agreement with results of McInman and Berger (1993) and extends this relationship to include additional mental health outcomes (i.e., anxiety and positive affect).

The observation of reductions in state anxiety following episodes of aerobic exercise and quiet rest is consistent with findings in previous research (Bahrke & Morgan, 1978; Raglin & Morgan, 1987; Youngstedt et al., 1998) and provides indirect support for the distraction hypothesis. Recently, some researchers have contended that improvements in psychological states following acute exercise are dependent upon the presence of initial mood disturbance (O'Connor et al., 1995; Rejeski et al., 1995). The larger ES associated with the state anxiety reductions following exercise and quiet rest within the high SPA group is consistent with this assertion. However, it is important to note that both the high and low SPA groups were characterized by baseline state anxiety values which fell within age related normative values (Spielberger et al., 1983). Thus, the present findings indicate

that anxiolytic benefits following exercise and quiet rest are realized by individuals without mild or moderate elevations in anxiety. While the exercise and quiet rest conditions were associated with similar reductions in state anxiety, the results indicate the conditions were associated with differential blood pressure responses. That is, while concomitant reductions in blood pressure were found to accompany changes in state anxiety following exercise independent of SPA level, no significant decrements in systolic blood pressure were evident following quiet rest for the high SPA group. Furthermore, a significant reduction in diastolic blood pressure only emerged 30 min following exercise in the high SPA group. These findings are in agreement with previous research which demonstrated that reductions in blood pressure associated with quiet rest are more transient than those observed following exercise (Raglin & Morgan, 1987). Thus, given that blood pressure is a physiological marker of anxiety, the observation of hypotension following exercise represents support for the assertion that exercise may possess qualitative benefits in comparison to quiet rest for the alleviation of anxiety (Raglin & Morgan, 1987). Post-exercise reductions in systolic blood pressure have been found to be more pronounced in hypertensive individuals (Rejeski, 1994). In accordance with this finding, the possibility that the relatively low baseline blood pressure values may have made the observation of hypotensive responses less likely following quiet rest (i.e., floor effect) cannot be overlooked. Therefore, further exploration of the relationship between anxiety and blood pressure responses during recovery from exercise and quiet rest are warranted.

Whereas the anxiolytic effects following exercise and quiet rest were comparable, the conditions were associated with different feeling state responses. Specifically,

elevations in tranquility were realized following both conditions, while improvements in positive engagement and revitalization only emerged following exercise. The mechanisms which contributed to the differential feeling states responses cannot be determined at the present time. However, when considering these findings within the rubric of the distraction hypothesis, the absence of improvements in positive engagement and revitalization suggests that the diversion quiet rest affords from daily worries may only be comparable to exercise in the improvement of specific aspects of emotional health. While both exercise and quiet rest may contribute to the enhancement of quiescent psychological states, due to its unique psychobiological demands, exercise may be superior to behavioral therapy in the realization of improvements in feeling states characterized by perceptions of activation, enjoyment, or enthusiasm. Nevertheless, this contention is purely speculative and additional research examining concomitant changes in positive and negative affect following behavioral therapy and exercise are necessary to substantiate this assertion.

In light of the ambiguous findings evident in prior literature, the observation of a post-exercise increase in positive engagement within the present investigation is of particular interest. Previous research suggests that greater increases in positive engagement are exhibited following participation in group exercise settings (Bozoian et al., 1994; Gauvin & Rejeski, 1993; Turner et al., 1997). It is reasonable to speculate that the social context inherent to group or naturalistic exercise settings may be necessary for the perception of enhanced feelings of positive engagement. Therefore, this finding highlights the importance of the naturalistic exercise settings in the observation of post-exercise positive feeling state responses.

In addition to the relevance of the documented psychological responses, the body composition characteristics of the sample also possess health implications. Consistent with prior research (Bane & McAuley, 1994; McAuley & Bane, 1996), females in the high SPA group were characterized by higher percent body fat and BMI in comparison with their less physique anxious counterparts. Nevertheless, the mean values of percent body fat and BMI for both SPA groups were within age related normative ranges. Thus, despite anthropometric characteristics that are considered both normal and healthy, the high SPA participants maintained excessive levels of physique related concerns. Because much prior SPA research has relied on indirect assessments of body composition (Bane & McAuley, 1998), it is unclear if the body composition values evident within the high SPA participants are representative of the majority of individuals with elevations in physique anxiety. More importantly from a public health perspective, this finding provides support for the contention that the ubiquitous societal pressure to obtain an unrealistic body shape or size may provoke body image disturbance within fit, healthy females. Provided the negative effects that self-presentational concerns regarding the physique may perpetuate (Leary et al., 1994), additional inquiry attempting to discern the nature of the interaction between SPA, body composition, and health behaviors is warranted.

In conclusion, the principal findings of the pilot study indicate that the psychological beneficence of acute bouts of aerobic exercise and quiet rest are realized independent of initial SPA level. Furthermore, the differential feeling states and blood pressure responses observed following the exercise and quiet rest conditions suggest that exercise may be associated with qualitative advantages for the amelioration of certain

aspects of mental and physical health. Because improvements in state anxiety, positive feeling states, and blood pressure can be viewed as beneficial health outcomes, the present findings address pertinent public health issues. That is, current estimates suggest that the pandemic nature of psychological disorders have exceeded the capacity of the current health care system (APA, 1994), and this disturbing trend has stimulated substantial interest in the identification of additional primary prevention strategies. The present findings support the assertion that exercise has the potential to function as one such alternative (Morgan, 1997; Raglin, 1997) and extends this finding to females evidencing elevations in physique anxiety. Moreover, the established role of physical activity in the prevention of chronic disease (USDHHS, 1996) may make exercise preferable to alternate forms of primary prevention (e.g., behavioral therapy).

In summary, the findings of the pilot study suggest that women with both high and low SPA experience improvements in psychological well-being following exercise. However, while the results of the pilot study contribute to the understanding of the relationship between SPA and psychological responses to exercise, this preliminary data does not provide a holistic solution to the question of whether or not SPA influences psychological responses to exercise. Therefore, the extent to which SPA moderates psychological responses following acute exercise remains unclear.

Consistent with accepted theories of stress (Lazarus & Opton, 1966; Spielberger et al., 1983), Rejeski's (1994) dose-response model places central importance upon an individual's interpretation of a given dose of exercise. Thus, within this theoretical perspective, the factors which interact to influence one's interpretation of an exercise

session would be salient determinants of the psychological responses following acute bouts of exercise. Previous research has shown that the social context of the exercise environment (McAuley & Mihalko, 1996; Turner et al., 1997), one's psychological disposition (Spielberger et al., 1983), in-task emotional and perceptual responses (Rejeski et al., 1995) and activity level (Dishman et al., 1994) are moderator variables for improvements in psychological well-being following acute exercise. In accordance with these findings, additional inquiry examining the relationship among these factors is needed to elucidate the extent to which SPA may influence the dose-response effects of acute exercise on psychological well-being. The findings of an experiment which examines the interaction among these factors would expand knowledge pertaining to the dose-response model and the exercise prescription guidelines necessary for the derivation of psychological benefits. Therefore, the primary purpose of the proposed investigation is to examine the influence of two different exercise environments on the in-task and post-exercise psychological responses following preferred and prescribed intensity bouts of aerobic exercise in low active females with high SPA.

CHAPTER THREE INTRODUCTION AND METHOD - STUDY TWO

Although the findings of the pilot study provide additional knowledge about the influence of SPA in the exercise-affect relationship, many questions persist. The development of a more comprehensive understanding of the role of SPA in the dose-response effects of acute exercise is contingent upon the further exploration of several issues. First, improvements in post-exercise psychological well-being may vary as a function of exercise intensity (Katula et al., 1999; Raglin & Wilson, 1996). Although the use of arbitrarily determined exercise intensities provides greater experimental control, previous research suggests that bouts incorporating self-selected exertion may be more advantageous for psychological well-being. Specifically, preferred intensity exercise is more ecologically valid (Gauvin et al., 1996) and may optimize the derivation of psychological benefits within some populations (Dishman et al., 1994; Pasley & Janelle, 1999). However, from an exercise prescription perspective, it is also important to determine the extent to which exercise intensity influences the observation of improvements in psychological well-being following exercise. Thus, further inquiry examining the interaction between SPA and preferred or prescribed exercise intensity will assist in the delineation of the dose-response relationship and provide additional knowledge regarding both the benefits and limitations of exercise as an intervention

knowledge regarding both the benefits and limitations of exercise as an intervention strategy for mood disturbance.

Second, because the participants' in-task psychological states were not assessed in the pilot study, alternate explanations for the post-exercise improvements in psychological states cannot be discounted. It is reasonable to speculate that the psychological benefits observed following the exercise session in the pilot study may have emerged from divergent in-task perceptions for the high and low SPA individuals. For example, if individuals with high SPA perceive self-presentational exercise environments as threatening, positive changes in psychological states following exercise may reflect relief at exiting the evaluative environment. Conversely, if low SPA individuals perceive the setting to be relaxing, the observation of post-exercise affective benefits may be attributable to the enjoyment provided by exposure to the activity (McAuley et al., 1996; Turner et al., 1997). Therefore, it is possible that one's SPA level may interact with the socially evaluative nature of the exercise environment to moderate the psychological consequences of acute exercise. Thus, further inquiry examining the extent to which SPA interacts with the exercise environment to moderate in-task and post-exercise psychological states is necessary.

Third, prior research suggests that psychological benefits following exercise persist longer than those demonstrated after passive behavioral therapy such as quiet rest (Garvin, Koltyn, & Morgan, 1997). However, the duration that improvements in positive psychological states (e.g., revitalization and positive engagement) are sustained following acute bouts of exercise remains unknown. Consequently, additional investigations of the

duration that positive psychological responses are maintained following different types of behavioral therapy (e.g., exercise, meditation, quiet rest) are needed.

Fourth, the sample in the pilot study was comprised of physically active women. It is estimated that nearly 60% of all adults are sedentary (USDHHS, 1996), thus, the degree to which the findings can be generalized to the majority of the adult population is not clear. Additionally, provided that current activity level may moderate the psychological consequences of acute bouts of exercise (Dishman et al., 1994), further exploration of the role of SPA in the psychological responses to exercise within low active or unfit individuals is warranted.

Finally, the observation of improvements in state anxiety and tranquility following both exercise and quiet rest in the pilot study provides indirect support for the distraction hypothesis. When considering the different pattern of feeling state responses which emerged following exercise and quiet rest, it is possible that mechanisms other than distraction may contribute to improvements in psychological well-being following exercise. One additional mechanism, self-efficacy, has been shown to moderate the amelioration of psychological well-being following acute exercise (Bozoian et al., 1994; Gauvin et al., 1996; Katula et al., 1999; McAuley et al., 1999; Rejeski et al., 1995). As Morgan (1997) suggests "It is customary when conducting scientific inquiry not only to test one's hypothesis, but there is a need to rule out alternative hypotheses" (p. 231). Thus, further exploration of the extent to which the distraction hypothesis and self-efficacy theory account for improvements in psychological well-being following acute exercise is warranted.

Several questions regarding the role of SPA in the relationship between exercise and psychological well-being remain unanswered. An investigation which elucidates the nature of the interaction between SPA, exercise intensity, and the socially evaluative nature of the exercise environment would increase the knowledge of the factors which contribute to the dose-response effects of exercise. Both the evaluative nature of the exercise environment as well as the psychological states experienced during and following acute exercise have been purported to be salient determinants of exercise participation (Gauvin & Rejeski, 1993; McAuley et al., 1996; Rejeski, 1994; Turner et al., 1997). Thus, research which contributes to the conceptual understanding of the factors which determine the psychological beneficence of exercise may hold important implications for the adoption of a physically active lifestyle.

Rationale for the Experiment

The primary purpose of this experiment was to examine the influence of the exercise environment and exercise intensity on the psychological consequences of acute aerobic exercise in low active females with high SPA. Specifically, manipulations of the exercise environment and exercise intensity were performed in order to contrast the effect of two exercise intensities (prescribed and preferred) and two exercise environments (self-presentational and laboratory) upon selected psychological responses.

The investigation was developed within the framework of Rejeski's (1994) dose-response model in order to examine the role of self-presentational concerns (i.e., SPA), exercise intensity, and current physical activity level in the observation of improvements in psychological well-being following acute exercise. As stated previously, Rejeski (1994)

contends that positive psychological changes following acute exercise result from the unique interaction of the social, biological, and affective variables which comprise the exercise session. Nevertheless, few researchers have directly tested Rejeski's model by examining these factors concomitantly. Rather, in contrast to the dose-response model, a majority of studies in the extant literature have examined only a single variable such as the exercise environment, intensity, or duration (McAuley et al., 1994; Petruzzello & Landers, 1994; Petruzzello & Tate, 1995). Given that each of the aforementioned factors interacts to determine any observable dose-response effects, the manipulation of only one factor would fail to provide additional insight into the dose-response model. Thus, further exploration of the dose-response model is needed.

Gauvin and Spence (1995) have suggested that the divergent methodologies employed within the social psychology and psychobiological approaches to exercise psychology research have also contributed to the lack of understanding of the dose-response model. To date, few examinations have integrated the social and psychobiological approaches in an attempt to delineate the dose-response effects of acute exercise. When considering that it is proposed within the dose-response model (Rejeski, 1994) that the interaction of social, biological, and affective factors are responsible for improvements in psychological well-being following exercise, the absence of research examining this interaction represents a limitation of the existing literature examining psychological responses to exercise. Thus, the integration of these perspectives through the concomitant examination of how SPA, the exercise environment, exercise intensity, and current physical activity level interact to determine psychological responses to

exercise is a strength of the proposed investigation. Additionally, findings from the study will contribute to an increased understanding of Rejeski's (1994) dose-response model and will expand knowledge of the psychological benefits of exercise in both the social psychology and psychobiological approaches to the study of exercise psychology.

Hypotheses

Due to the lack of previous research integrating the social and psychobiological approaches, the hypotheses are brief and based solely on the results of prior investigations. First, the prescribed intensity group will be associated with higher heart rate and perceived exertion during the exercise session. The increase in heart rate and perceived exertion will be accompanied by increased perceptions of activation. This hypothesis is based on previous research which suggests that physiological and psychological indicants of exertion are lower during self-selected activities (Dishman et al., 1994; Farrell et al., 1982).

Second, baseline self-efficacy will be higher in the preferred intensity group compared to the prescribed intensity group. This hypothesis is consistent with the findings of prior research which suggest that self-efficacy of inactive individuals is lower during high intensity activities (Treasure & Newberry, 1998).

Third, the association between self-efficacy and in-task and post-exercise psychological responses will be stronger in the prescribed group. This hypothesis is based on research which indicates that: (a) self-selected exercise intensity is lower than prescribed exercise intensity and (b) the strength of the association between self-efficacy and psychological states increases in a linear fashion with the demand of the task (Bozoian

et al., 1994; Dishman et al., 1994; Katula et al., 1999; McAuley et al., 1999; Treasure et al., 1998).

Fourth, improvements in psychological states will be greater in the preferred intensity group. This hypothesis is based on research findings which suggest that: (a) self-selected exercise intensities are lower than arbitrarily determined intensities (Dishman et al., 1994; Farrell et al., 1982; Pasley & Janelle, 1999) and (b) psychological well-being is optimized following moderate intensity bouts of exercise (Berger & Owen, 1992; Steptoe & Cox, 1990).

Fifth, the self-presentational exercise environment will be associated with increased perceptions of exertion and arousal as well as decreased self-efficacy in comparison with the laboratory environment. This hypothesis is consistent with previous findings which suggest that self-presentational environments are linked to increased perceptions of effort and decreased self-efficacy in females with high SPA (Katula et al., 1998).

Sixth, the laboratory exercise setting will be associated with more positive in-task psychological states (e.g., state anxiety, feeling states, and affect) compared to the self-presentational exercise environment. This hypothesis is based on the findings of investigations which indicate that: (a) high SPA females prefer private exercise environments (Crawford & Eklund, 1994; Spink, 1992) and (b) high SPA females report increased perceptions of stress in socially evaluative settings (Hart et al., 1989).

Seventh, the observation of post-exercise improvements in psychological well-being will be greater following the laboratory exercise environment. This hypothesis is inconsistent with the assertion that the social context of an exercise setting contributes to

improvements in psychological well-being (McAuley et al., 1996; Rejeski, 1994; Turner et al., 1997). It is in agreement, however, with self-presentational theory which suggests that women with high SPA will experience increased stress during exposure to socially evaluative environments (Hart et al., 1989). It is also consistent with prior research examining the exercise-affect relationship that indicates that in-task psychological states are predictive of post-exercise improvements in psychological well-being (Bozoian et al., 1994; Katula et al., 1999; Treasure et al., 1998).

Eighth, while improvements in psychological well-being will occur following both exercise and quiet rest, the amelioration of psychological states will persist for a longer duration following the exercise condition. This hypothesis is based on the findings of previous research which demonstrated that acute exercise and quiet rest are associated with improvements in psychological well-being, but such benefits persist longer following exercise (Garvin et al., 1997; Raglin & Morgan, 1987; Youngstedt et al., 1998).

Finally, based on findings of the pilot study, both exercise and quiet rest will be associated with improvements in quiescent psychological states (e.g., state anxiety and tranquility). However, improvements in feelings of activation (e.g., revitalization and positive engagement) will be greater following exercise.

The investigation has been developed within the framework of self-presentational theory to examine how the relationship among SPA, the socially evaluative nature of the exercise environment, and exercise intensity influences in-task and post-exercise psychological responses to acute exercise. Findings from the investigation will address issues of both theoretical and practical importance and will also contribute to an increased

understanding the dose-response relationship between exercise and psychological well-being.

Participants

Thirty female volunteers were recruited from courses in the Department of Exercise and Sport Sciences at the University of Florida. Males were excluded from the investigation based on the findings of previous research which indicate that: (a) the intensity and direction of SPA differs as a function of gender (Hart et al., 1989), (b) females are more likely than males to report negative emotional states (Verbrugge, 1985), and (c) females report higher state anxiety than males (Spielberger et al., 1983).

Sample size was determined using Potvin and Schutz's (1996) power tables for repeated measures and mixed model research designs. Sample size was calculated at an alpha of .05, using an average correlation value between adjacent repeated measures of .80, and a meaningful effect size of .60. Values used for sample size calculation were derived from experiment one and previous research (Breus & O'Connor, 1998; Youngstedt et al., 1998). The sample size of 15 participants in each group provides a power which exceeds .90 for the main effects and .75 for the interaction effects of interest.

Measures

Social Physique Anxiety Scale (SPAS). SPA was assessed using the nine-item SPAS which assesses a trait measure of self-presentational anxiety regarding the appearance of one's physique (Martin et al., 1997; see Appendix B). Participants indicated the degree to which each item was characteristic of them on a 5-point likert scale. SPAS scores range from 9 (low) to 45 (high). Research has found the 9-item

SPAS demonstrates acceptable convergent and divergent validity and adequate internal consistency (Hausenblas & Martin, 1999; Martin et al., 1997). Consistent with these findings, the SPAS exhibited acceptable internal consistency in the pilot study ($\alpha = .86$).

State-Trait Anxiety Inventory (STAI). Anxiety was measured using the state (Form Y-1) and trait (Form Y-2) portions of the STAI (Spielberger et al., 1983; see Appendix C). Form Y-1 is a 20-item inventory assesses state anxiety, which is defined as transient, situation specific feelings of apprehension or worry. Form Y-2 assesses trait anxiety, or one's general tendency or vulnerability to experience anxiety. The STAI has undergone rigorous validation procedures and has been shown to demonstrate convergent, divergent, and construct validity as well as adequate internal consistency (Spielberger et al., 1983; Gauvin & Spence, 1998). Consistent with these findings, the STAI (Form Y-1) exhibited adequate internal consistency in the pilot investigation ($\alpha = .89$).

Exercise-Induced Feeling Inventory (EFI). The EFI is a 12-item multidimensional affective measure that assesses the extent to which participants experience four distinct feeling states: positive engagement, revitalization, tranquility, and physical exhaustion (Gauvin & Rejeski, 1993; see Appendix C). The EFI has been shown to exhibit convergent and divergent validity as well as acceptable internal consistency (Gauvin & Rejeski, 1993; Gauvin et al., 1996; Gauvin & Spence, 1998). The EFI also demonstrated adequate internal consistency within the present sample with alpha values exceeding .86 for each subscale.

Task Self-Efficacy Scale. Participants' belief in their physical capability to cycle at

a preferred and prescribed intensity over incremental blocks of time was assessed using two four-item self-efficacy scales (McAuley & Mihalko, 1998; see Appendix C). Each self-efficacy scale is comprised of four items. Each item represents an increment of 5 min in duration ranging from 5 to 20 min. Participants are asked to indicate their degree of confidence to successfully complete each five min increment of the cycling task. The first scale assesses self-efficacy to complete each of the five min increments at the prescribed exercise intensity. The second scale assesses self-efficacy to complete each of the five min increments at a preferred exercise intensity. Responses are scored on a 100-point percentage scale composed of 10-point increments ranging from 0 (no confidence at all) to 100% (complete confidence). A total self-efficacy score is obtained by summing the confidence ratings and dividing by the number of questions. Internal consistency of the scale has been found to exceed .90 (McAuley et al., 1999) and this format for measuring self-efficacy in exercise tasks has been used extensively in previous research (Katula et al., 1999; McAuley & Courneya, 1992; McAuley et al., 1999; Treasure & Newberry, 1998).

Affect Grid. The Affect Grid is a single item affective scale derived from the circumplex model of affect (Russell, Weiss, & Mendelsohn, 1989; see Appendix C). The grid assesses two dimensions of affect: valence (pleasure-displeasure) and activation (arousal-sleepiness). The vertical dimension of the grid represents the activation continuum, while the horizontal dimension depicts the valence continuum. Verbal anchors are present on each side of the activation (Sleepiness; High arousal) and valence (Unpleasant feelings, Stress, Depression; Pleasant feelings; Excitement, Relaxation) dimensions. Participants place a single mark on the grid corresponding with their current

level of activation and valence. Scores for each dimension range from one (Unpleasant feelings; Sleepiness) to nine (Pleasant feelings; High arousal). The Affect Grid has been shown to demonstrate convergent and discriminant validity during dynamic situations in previous research (Gauvin & Spence, 1998; Russell et al., 1989).

Feeling Scale. The Feeling Scale is a single item measure of affect (Hardy & Rejeski, 1989; see Appendix C). Participants will select "How they feel right now" on a scale ranging from -5 (I feel very bad) to 5 (I feel very good). The Feeling Scale has been shown to exhibit adequate divergent validity (Hardy & Rejeski, 1989). However, relatively little is known regarding its concurrent or convergent validity (Gauvin & Spence, 1998). Therefore, findings from the proposed investigation will contribute to an increased understanding of the psychometric properties of the Feeling Scale.

Ratings of Perceived Exertion (RPE). In order to quantify the participants' overall effort sense during the exercise sessions, RPE were obtained using Borg's 6 - 20 scale (1973; see Appendix C). RPE has been conceptualized as a psychobiological configuration of sensations associated with the perception of effort during exercise and has been used extensively in previous exercise psychology research (Borg, 1998). The original 6-20 version of the RPE scale has been shown to demonstrate concurrent, predictive, and construct validity as well as adequate test-retest reliability (Borg, 1998).

Leisure-Time Exercise Questionnaire (LTEQ). The LTEQ measures the self-reported frequency of strenuous, moderate, and mild bouts of exercise during the course of a typical week (Godin & Shephard, 1985; see Appendix B). LTEQ subscale scores are converted into metabolic equivalents (METs; mild \times 3 + moderate \times 5 + strenuous \times 9)

and summed to provide an estimate of total METS expenditure from exercise for an average week. Previous research has shown that the LTEQ possesses adequate reliability and validity (Jacobs, Ainsworth, Hartman, & Leon, 1993).

Heart rate. Heart rate was measured using the Polar Vantage XL Heart Rate Monitor. Participants were fitted with the Polar monitor around the chest and assessments of heart rate will be obtained during each condition.

Body composition. Two measures of body composition were obtained. First, percent body fat will be assessed with skinfold calipers using the three site technique (i.e., triceps, suprailliac, & quadriceps; Jackson et al., 1980). The average of three skinfold measurements obtained from each site are converted to an estimate of body composition using the generalized equations developed by Jackson et al. (1980). Second, body mass index (BMI) was calculated from direct height and weight assessments.

Procedures

Inclusion Criteria

Prior to participation, each volunteer completed the LTEQ and the SPAS in order to obtain a sample composed of low active women with high SPA. Volunteers scoring 36 or above on the SPAS who report two or fewer bouts of exercise during a typical week on the LTEQ were eligible to participate in the study. The high SPA value is approximately one standard deviation above the average SPAS scores of college age females reported in both the pilot study and previous research (Hausenblas & Martin, 1999; Martin et al., 1997). Low active criteria were determined by self-report of exercise levels which fall below the threshold for the derivation of health and fitness benefits (USDHHS, 1996).

Volunteers eligible for participation completed a medical history questionnaire as well as read and signed an informed consent document that was approved by the University of Florida's Institutional Review Board prior to participation (see Appendix A). All eligible participants who completed the requirements of the study will received class extra credit for their involvement in the experiment.

Intensity Groups

Volunteers were randomly assigned to a preferred or prescribed intensity group. Participants assigned to the prescribed intensity group completed two 20-min bouts of cycling while maintaining an intensity of 70-80% of age predicted maximum heart rate. During the prescribed exercise sessions, participants wore a wrist monitor which was programmed to indicate when the prescribed heart rate range had been reached. Participants assigned to the preferred intensity condition completed two bouts of cycling at a preferred or self-selected level of heart rate range. Exercise heart rate zones were calculated using a modified Karvonen formula (Karvonen, Kentala, & Mustala, 1957).

The exercise protocol consisted of a 5-min warm-up for each group. Following the warm-up period, participants in the preferred intensity group were permitted to self-select the resistance and pedaling cadence of the stationary cycle for the duration of the session. During the warm-up period for the prescribed intensity group, participants maintained a pedal cadence of 50 revolutions per minute and the resistance on the stationary cycle was gradually increased until the participant reached her target heart rate range. Participants then exercised at this intensity for the duration of the session. Pedal

cadence and resistance was adjusted accordingly in order to maintain target heart rate range.

Treatment Conditions

Participants in each intensity group completed the following three experimental conditions: (a) 20-min bout of cycling in a self-presentational exercise environment; (b) 20-min bout of cycling in a laboratory exercise environment; and (c) 20-min bout of quiet rest. The order of each condition was randomly assigned and presented in a counterbalanced fashion. Conditions were completed on three separate days and separated by a 48-hour rest period. In an attempt to standardize the attire during each condition and attenuate the potential use of clothing as part of protective (e.g., loose, baggy attire) or acquisitive (e.g., tight, more revealing attire) self-presentational strategies, participants were required to wear a t-shirt and pair of shorts to each session.

Self-presentational exercise condition. The self-presentational exercise condition was conducted at the Student Recreation and Fitness Center, a university fitness facility located directly adjacent to the exercise psychology laboratory. Participants completed the exercise session at the respective level of intensity (preferred or prescribed) on a stationary cycle located in front of a full length mirror. The mirror was situated in a manner that allowed the participants to view themselves as they exercised. The constant presence of other exercisers, staff members, and the full length mirror created an exercise environment which provides ample opportunity for the realization of self-presentational concerns. This procedure has been shown to be an effective method for examining the socially evaluative nature of exercise settings (Katula et al., 1998).

Laboratory exercise condition. The laboratory exercise condition was performed in a private laboratory setting without mirrors or other exercisers. The investigator and the participant were the only people in the room during this condition. However, it is possible that the presence of the investigator might influence the socially evaluative nature of the environment. Thus, in order to maintain the private nature of the setting, interaction between the participant and investigator was limited to assessment procedures. At all other times during the laboratory condition, the experimenter remained out of view and refrained from social interaction with the participant.

Quiet rest condition. During the quiet rest session participants sat quietly for 20-min in a room free of distractions within the exercise psychology laboratory. Participants were not provided with any specific instructions beyond being requested not to sleep or work during the session. At the conclusion of the post-session assessment interval, participants were given the option to receive a body composition measurement. To minimize the influence of the body composition evaluation on the dependent measures, participants were unaware that the test would be performed following the quiet rest condition until after all assessments were complete.

General Procedures

Upon arrival at the laboratory participants completed the baseline assessments of STAI and EFL. At the initial session, the participants also completed Form Y-2 of the STAI and were instructed on the use of the feeling scale, affect grid, and perceived exertion scales. Following the completion of the baseline assessments, participants were fitted with the Polar Heart Rate monitor and resting heart rate was obtained. To preclude

the ability to deduce what experimental treatment was performed during a given session, participants were informed that it is possible to receive any combination of conditions. Therefore, participants believed that during their three sessions they may be assigned to: (a) only exercise conditions; (b) only quiet rest conditions; or (c) a combination of exercise and quiet rest conditions. Additionally, in order to minimize the potential influence of demand characteristics or expectancy effects, participants were only informed of their condition following the completion of the baseline STAI, EFI, and resting heart rate assessments.

Participants then began the randomly assigned condition which lasted 20-min in duration. Self-efficacy theory suggests that individuals must have experience with the task to accurately assess their efficacy expectations (Bandura, 1997). Thus, consistent with procedures used in previous research (Treasure & Newberry, 1998), the baseline self-efficacy assessment was obtained during the last minute of the warm-up stage of the exercise conditions. Self-efficacy was not measured during the quiet rest condition. In-task assessments of the Feeling Scale, Affect Grid, and heart rate responses were obtained immediately prior to, as well as every five min during, and immediately following each condition. RPE was also assessed concomitantly with the Feeling Scale, Affect Grid, and heart rate responses during the exercise conditions. A single in-task assessment of STAI and EFI was obtained during the last 2-min of each session when the cumulative effect of the condition was at its greatest.

At the conclusion of each condition participants returned to the exercise psychology laboratory and sat quietly in a room free of distractions for 5-min. Following

the 5-min rest period, assessments of STAI, EFI, and self-efficacy were completed. At this time, participants were permitted to leave the laboratory and resume their normal, daily activities. Each participant was provided with a pager and a folder containing three copies of the STAI and EFI. Participants completed each of the three remaining post-exercise assessments using a signal contingent technique (Gauvin et al., 1996).

Specifically, participants received a pager tone instructing them to complete the STAI and EFI at each assessment interval. In order to assess activity when responding to pager tones, participants also described the activity being performed at the time of the sampling on a behavioral questionnaire (see Appendix C). These data were coded into categories and retained for analysis purposes.

Signal contingent assessments of STAI and EFI were completed at three pre-determined intervals (i.e., 60, 120, and 180-min following each condition). Participants, however, were not informed when the pager tones would be sent. Rather, participants were instructed that the pager would be activated at random intervals three times during the four hour period immediately following the completion of each condition. A 15-min window was allotted to complete each assessment following the activation of the pager. Finally, in order to examine the efficacy of the environmental manipulation, participants rated how stressful they perceived each experimental condition to be from a physique evaluation perspective at the conclusion of the study.

Research Design and Data Analysis

The experimental procedure yielded a 2 (Intensity) x 3 (Condition) x 6 (Time) mixed model design with repeated measures on the condition and time factors. Intensity

represented a between subjects factor while both condition and time were within subjects factors. The two levels of the intensity factor represented the preferred and prescribed groups. The three levels of the condition factor represented the self-presentational exercise condition, laboratory exercise condition, and quiet rest condition. Finally, the six levels of the time factor represented the assessment intervals of the primary dependent measures (STAI and EFI), pre, during, and 5, 60, 120, and 180 min following each of the three conditions.

Several analyses were conducted to examine the data collected on the dependent measures of interest. Given the significant correlations between the STAI and EFI subscales reported in both the pilot study and previous research (Bozoian et al., 1994; Gauvin & Rejeski, 1993; Rejeski et al., 1995), STAI and the EFI subscales were analyzed via a 2 (Intensity) x 3 (Condition) x 6 (Time) mixed model multivariate analysis of variance (MANOVA). Univariate analysis of variance (ANOVA) with Bonferroni adjustments ($\alpha = .01$) were employed for follow-up analysis of the significant multivariate effects. Tukey post hoc analysis was used to determine the location of significant mean differences.

Analysis of self-efficacy was conducted using a 2 (Intensity) x 2 (Condition) x 2 (Time) mixed model ANOVA with repeated measures on the condition and time factors. Separate 2 (Intensity) x 3 (Condition) x 6 (Time) mixed model ANOVAs with Bonferroni corrections ($\alpha = .025$) were employed to analyze the feeling scale and affect grid responses. Analysis of RPE was conducted using a 2 (Intensity) x 2 (Condition) x 4 (Time) ANOVA. Effect sizes were computed by subtracting the post-condition means

from the baseline mean and dividing by the standard deviation pooled (Thomas, Salazar, & Landers, 1991).

Finally, two hierarchical regression analyses were performed to address the influence of baseline self-efficacy and in-task responses on changes in psychological well-being. The first regression analyses examined the influence of baseline self-efficacy and psychological states (STAI and EFI) on the in-task psychological states (e.g., STAI, EFI, Feeling Scale, Affect Grid, and perceived exertion) within each intensity group. The second regression analyses was conducted to examine the influence of the aforementioned in-task psychological states on post-session psychological well-being (STAI and EFI) within each intensity group.

CHAPTER 4

RESULTS

Findings from the investigation have been divided into four primary areas and will be presented in the following sequence. First, the participants' demographic characteristics are summarized. Second, the manipulation check results are provided. Third, the findings regarding the psychological (i.e., STAI, EFI, feeling scale, affect grid, self-efficacy, and RPE) and physiological (i.e., heart rate) responses following the exercise and quiet rest conditions are presented. Finally, the results from the regression analyses examining the relationship among baseline values, in-task affect, and post-exercise psychological responses in each of the intensity groups are summarized.

Demographic Characteristics

Thirty female university students (M age = 20.2 years, SD = 1.6; 77% Caucasian) were recruited to participate in the study. Upon meeting the inclusion criteria, participants were randomly assigned to either a preferred or prescribed exercise intensity group. Biometric data indicated that there were no significant differences between the intensity groups on age, $t(28) = .34$, $p > .05$, height, $t(28) = .64$, $p > .05$, weight, $t(28) = .07$, $p > .05$, body mass index, $t(28) = .92$, $p > .05$, or percent body fat, $t(28) = .07$, $p > .05$. Analyses of LTEQ data, $t(28) = .67$, $p > .05$, indicated the absence of significant differences in self-reported physical activity between groups (Preferred: M = 1.2

sessions/week, $SD = .86$; Prescribed: $M = 1.4$ sessions/week, $SD = .98$). Finally, participants in the preferred and prescribed intensity groups did not differ on trait anxiety, $t(28) = .12, p > .05$. Therefore, the participants in the preferred and prescribed intensity groups did not differ significantly on anthropometric characteristics, trait anxiety, or involvement in exercise during a typical week (see Table 4.1 for descriptive statistics).

Manipulation Check

On average, 36 exercisers (14 male and 22 female) were present in the student recreation center during the self-presentational condition. Thus, the goal of obtaining a public exercise environment in which other exercisers were present was successfully achieved. Furthermore, in order to quantify the extent to which each session was perceived to be threatening from a physique evaluation perspective, participants rated each condition at the conclusion of the study. Participants rated their perceived stress level during each condition (i.e., laboratory, self-presentation, and quiet rest) using a 5 point likert scale containing the following responses: 0 = not at all stressful; 1 = somewhat stressful; 2 = moderately stressful; 3 = very stressful; 4 = extremely stressful. Results of a one-way ANOVA revealed a significant difference between conditions, $F(2, 86) = 35.28, p < .001$. Post-hoc analyses demonstrated that the participants rated the self-presentational condition significantly more stressful than the laboratory condition. Additionally, both exercise conditions were rated as significantly more stressful than the quiet rest condition (see Table 4.1 for the descriptive statistics). Thus, as hypothesized, the self-presentational condition was viewed by the participants as the most stressful environment. Signal contingent assessments were obtained to examine the participants'

Table 4.1

Mean (M) and Standard Deviation (SD) Scores for the Demographic Characteristics of the Preferred and Prescribed Intensity Groups.

Variable	Preferred ($n = 15$)	Prescribed ($n = 15$)
	\bar{M} (SD)	\bar{M} (SD)
Age	20.0 (1.4)	20.4 (1.8)
Height	65.4 (2.0)	64.9 (1.9)
Weight	153.2 (20.8)	152.1 (20.9)
Percent Body Fat	22.8 (3.5)	22.8 (3.9)
Body Mass Index	25.2 (2.8)	26.5 (4.2)
Exercise Sessions Per Week	1.2 (.86)	1.4 (1.0)
Trait Anxiety	43.4 (7.4)	43.0 (9.7)
Stress Ratings		
Self-Presentation	2.4 (.92)	2.7 (.83)
Laboratory	1.4 (.51)	1.8 (.70)
Quiet Rest	1.0 (.38)	.93 (.33)

psychological states following the resumption of normal, daily activity. Of the 270 pages sent, 84% were received by the participant while they were engaged in an activity they performed on a daily basis. The breakdown of activity during the signal contingent assessment period was: 20% studying; 19% in class; 12% eating; 11% watching television; 8% traveling to class or home; and 8% talking on the phone. The remaining 22% were classified as “other” activities which were composed of activities such as cleaning, shopping, changing clothes, and tanning. Thus, the signal contingent assessment procedure was successful in obtaining measurements of psychological states once individuals had resumed typical daily activities.

Psychological State and Heart Rate Responses

STAI and EFI Responses

Both the STAI ($\alpha = .96$) and EFI (alphas: positive engagement = .83; revitalization = .82; tranquility = .86; physical exhaustion = .79) demonstrated adequate reliability within the present study. Consistent with previous research (Bozoian et al., 1994; Rejeski et al., 1995), STAI and EFI subscale data were analyzed with a 2 (Intensity) \times 3 (Condition) \times 6 (Time) mixed MANOVA with repeated measures on the last two factors. The MANOVA with Intensity as the between subjects factor and Condition and Time as the within subjects factors yielded significant main effects for Condition, Wilks' $\lambda = .73$, $F(5, 79) = 2.64$, $p < .004$, and Time, Wilks' $\lambda = .29$, $F(25, 59) = 5.84$, $p < .001$, as well as a significant Condition \times Time interaction, Wilks' $\lambda = .75$, $F(50, 118) = 2.97$, $p < .001$. Follow-up univariate analyses were conducted with a significance level of .01. Epsilon values for all univariate

Table 4.2

Mean (M) and Standard Deviation (SD) Scores of the Psychological and Physiological Responses Before, During, and Following the Self-Presentational, Laboratory, and Quiet Rest Conditions.

Variable	Self-Presentation	Laboratory	Quiet Rest
	M (SD)	M (SD)	M (SD)
<u>State Anxiety</u>			
Pre	35.2 (7.1)	35.1 (7.4)	36.2 (8.4)
Dur	39.2 (7.4)*	35.8 (6.9)	33.6 (8.1)
P-5	30.9 (7.1)*	31.4 (5.9)*	32.9 (9.4)
P-60	32.7 (9.4)	29.9 (6.6)*	34.7 (9.6)
P-120	33.1 (9.7)	29.8 (7.2)*	33.9 (9.9)
P-180	34.8 (8.9)	32.5 (8.2)	33.6 (9.7)
<u>Positive Engagement</u>			
Pre	6.5 (3.2)	6.0 (2.8)	6.5 (3.2)
Dur	7.5 (2.6)	7.0 (2.9)	5.0 (3.0)**
P-5	7.7 (3.0)*	7.2 (2.9)*	5.0 (3.3)*
P-60	7.1 (3.4)	8.0 (2.7)*	5.7 (3.7)
P-120	6.4 (3.3)	7.0 (2.7)	6.0 (3.3)
P-180	6.8 (3.5)	6.2 (3.0)	6.0 (3.3)
<u>Revitalization</u>			
Pre	4.6 (2.9)	4.3 (2.9)	4.5 (2.6)
Dur	6.6 (2.4)	6.5 (2.7)*	3.7 (3.1)**
P-5	7.8 (2.5)	7.3 (2.5)*	3.7 (3.1)**
P-60	7.0 (3.0)	7.3 (2.8)*	4.4 (3.1)**
P-120	6.1 (2.7)	6.5 (2.8)*	4.5 (2.8)**
P-180	6.0 (2.8)	5.7 (3.4)*	4.9 (3.5)**

Tranquility

Pre	7.2 (2.6)	7.6 (2.5)	7.4 (3.0)
Dur	5.8 (2.5)*	7.0 (2.6)	8.6 (2.8)
P-5	8.2 (2.4)	8.7 (2.0)	8.2 (3.0)
P-60	7.9 (3.1)	8.7 (2.4)	7.2 (3.3)
P-120	8.3 (3.2)	9.0 (2.0)*	7.5 (2.7)
P-180	7.4 (3.6)	7.9 (2.8)	7.3 (2.8)

Physical Exhaustion

Pre	4.9 (3.8)	5.5 (3.3)	5.7 (3.2)
Dur	5.4 (2.6)	5.4 (2.6)	5.8 (3.2)
P-5	4.1 (2.6)	4.2 (2.4)	5.8 (3.3)
P-60	3.8 (3.6)	4.0 (2.9)	4.8 (3.4)
P-120	3.9 (3.0)	5.2 (3.4)	4.8 (3.4)
P-180	4.2 (2.3)	5.9 (3.8)	4.1 (3.0)

Feeling Scale

Pre	2.1 (1.6)	1.6 (1.6)	1.7 (1.6)
Dur-5	1.5 (1.6)*	1.9 (1.9)	2.0 (2.0)
Dur-10	1.5 (1.8)*	2.0 (1.8)	2.1 (1.8)
Dur-15	2.1 (1.8)	2.4 (1.3)*	2.0 (1.7)
Dur-20	2.8 (1.6)*	2.8 (1.2)*	2.0 (1.7)
P-5	3.2 (1.2)*	3.2 (1.0)*	1.9 (1.6)

Affect

Pre	6.0 (1.8)	6.0 (1.9)	6.1 (1.2)
Dur-5	5.8 (1.4)	6.2 (1.0)	6.4 (1.3)
Dur-10	5.9 (1.3)	6.2 (1.4)	6.5 (1.4)
Dur-15	6.0 (1.3)	6.4 (1.5)	6.5 (1.4)
Dur-20	7.0 (1.4)*	6.9 (1.6)*	6.3 (1.5)
P-5	7.3 (1.4)*	7.6 (1.0)*	6.7 (1.3)

Activation

Pre	4.1 (1.7)	3.8 (1.8)	4.2 (1.3)
Dur-5	5.8 (1.3)*	5.4 (1.5)*	4.2 (1.5)**
Dur-10	6.2 (1.4)*	6.1 (1.3)*	4.0 (1.7)**
Dur-15	6.6 (1.3)*	6.6 (1.3)*	3.7 (1.8)**
Dur-20	6.9 (1.4)*	6.7 (1.4)*	3.8 (1.8)**
P-5	5.6 (1.7)*	5.4 (1.8)*	3.6 (1.9)**

Self-Efficacy

Pre	79.8 (17.1)	88.5 (14.9)
P-5	94.6 (9.7)*	93.5 (12.3)*

RPE

Dur-5	13.3 (1.7)	12.4 (2.1)
Dur-10	13.7 (1.9)	13.2 (2.1)
Dur-15	14.2 (1.9)	13.6 (2.0)
Dur-20	14.5 (1.8)	13.7 (2.0)

Heart Rate

Pre	80.1 (8.9)	81.4 (8.2)	79.6 (10.7)
Dur-5	146.0 (12.9)*	139.9 (16.9)*	75.5 (10.2)**
Dur-10	153.5 (13.1)*	146.2 (16.6)*	73.7 (9.4)**
Dur-15	157.5 (12.8)*	148.6 (16.9)*	73.6 (9.4)**
Dur-20	158.1 (11.0)*	148.4 (16.3)*	73.1 (9.1)**
P-5	98.6 (9.4)*	93.5 (16.8)*	73.6 (8.0)**

* = significantly different ($p < .01$) from baseline values.

** = significantly different ($p < .01$) from the self-presentational and laboratory conditions.

Table 4.3

Mean (M) and Standard Deviation (SD) Scores of the Psychological and Physiological Responses for the Preferred and Prescribed Intensity Groups Before, During, and Following the Self-Presentational, Laboratory, and Quiet Rest Conditions.

Variable	Self-Presentation	Laboratory	Quiet Rest
	M (SD)	M (SD)	M (SD)
<u>State Anxiety</u>			
Preferred			
Pre	35.6 (6.0)	36.3 (6.4)	36.7 (7.9)
Dur	38.2 (5.6)	35.1 (6.4)	34.2 (6.9)
P-5	30.8 (5.7)	31.4 (5.4)	32.3 (7.5)
P-60	34.0 (9.9)	30.0 (6.6)	36.4 (8.3)
P-120	31.4 (8.0)	29.9 (7.4)	36.7 (10.1)
P-180	33.4 (8.3)	30.7 (5.4)	36.4 (9.1)
Prescribed			
Pre	34.9 (8.3)	33.9 (8.4)	35.9 (9.2)
Dur	40.1 (8.9)	36.6 (7.4)	33.0 (9.1)
P-5	31.1 (8.5)	31.4 (6.6)	34.2 (11.2)
P-60	31.4 (9.1)	29.9 (6.7)	33.1 (11.3)
P-120	34.9 (11.2)	29.9 (7.3)	31.0 (9.4)
P-180	36.1 (9.5)	34.3 (10.2)	30.4 (10.2)
<u>Positive Engagement</u>			
Preferred			
Pre	6.4 (3.5)	6.5 (2.9)	6.1 (3.5)
Dur	7.7 (2.4)	7.5 (2.6)	4.7 (3.3)
P-5	7.7 (2.9)	7.4 (2.8)	4.6 (3.7)
P-60	7.0 (3.5)	7.5 (2.6)	5.3 (4.0)
P-120	6.5 (3.2)	7.3 (2.8)	6.1 (3.8)
P-180	7.3 (3.5)	6.7 (2.9)	5.7 (3.9)

Prescribed

Pre	6.5 (3.0)	5.5 (2.7)	6.5 (2.6)
Dur	7.5 (2.8)	6.8 (3.3)	5.1 (2.7)
P-5	7.7 (3.2)	6.7 (3.0)	5.2 (2.8)
P-60	7.2 (3.5)	8.4 (2.8)	5.9 (3.5)
P-120	6.3 (3.6)	6.7 (2.6)	5.9 (2.9)
P-180	6.3 (3.6)	5.7 (3.2)	6.1 (2.5)

Revitalization

Preferred

Pre	4.5 (3.3)	4.7 (3.1)	4.3 (3.1)
Dur	7.1 (2.6)	6.4 (3.2)	3.6 (3.4)
P-5	8.0 (2.8)	7.6 (3.0)	3.6 (3.7)
P-60	6.8 (3.0)	6.9 (2.9)	3.6 (3.1)
P-120	6.2 (2.8)	6.5 (3.1)	4.3 (3.1)
P-180	5.9 (2.8)	5.7 (3.7)	4.8 (3.9)

Prescribed

Pre	4.7 (2.7)	4.0 (2.9)	4.5 (2.1)
Dur	6.2 (2.1)	6.7 (2.4)	3.4 (2.6)
P-5	7.6 (2.2)	7.1 (1.9)	3.4 (2.1)
P-60	7.1 (3.1)	7.8 (2.8)	5.1 (3.0)
P-120	6.0 (2.7)	6.5 (2.6)	4.6 (2.6)
P-180	6.1 (2.8)	5.4 (3.2)	4.9 (3.3)

Tranquility

Preferred

Pre	7.1 (2.6)	7.3 (2.5)	7.6 (3.1)
Dur	6.3 (2.8)	7.6 (2.8)	8.7 (3.0)
P-5	8.8 (2.3)	8.9 (2.0)	8.4 (3.2)
P-60	7.5 (3.6)	8.6 (2.5)	6.8 (3.2)
P-120	9.3 (2.7)	9.5 (2.3)	7.1 (3.2)
P-180	8.1 (3.8)	8.6 (2.4)	6.7 (3.3)

Prescribed

Pre	7.3 (2.8)	7.9 (2.5)	7.2 (3.0)
Dur	5.5 (2.2)	6.5 (2.3)	8.4 (2.7)
P-5	7.6 (2.4)	8.6 (2.0)	7.9 (3.0)
P-60	8.3 (2.7)	8.9 (2.4)	7.4 (3.6)
P-120	7.3 (3.4)	8.5 (1.7)	7.9 (2.1)
P-180	6.7 (3.3)	7.1 (3.1)	7.9 (2.2)

Physical Exhaustion

Preferred

Pre	4.9 (4.0)	5.6 (2.9)	5.5 (2.8)
Dur	4.9 (2.2)	4.8 (2.6)	5.5 (3.0)
P-5	3.7 (2.5)	3.9 (3.1)	5.6 (3.2)
P-60	3.5 (3.4)	3.5 (2.7)	4.8 (3.6)
P-120	3.8 (2.7)	3.4 (3.0)	4.5 (3.7)
P-180	2.9 (2.2)	4.4 (2.7)	4.4 (3.4)

Prescribed

Pre	4.9 (3.6)	5.5 (3.7)	5.9 (3.3)
Dur	5.8 (2.9)	6.1 (2.5)	6.4 (3.4)
P-5	4.5 (2.7)	4.6 (1.4)	6.3 (3.6)
P-60	4.1 (3.9)	4.4 (3.1)	5.0 (3.2)
P-120	3.9 (3.0)	5.2 (3.4)	5.2 (3.3)
P-180	4.2 (2.3)	5.9 (3.8)	3.9 (2.9)

Feeling Scale

Preferred

Pre	1.9 (1.4)	1.9 (1.4)	1.9 (1.9)
Dur-5	1.9 (1.3)	2.3 (1.2)	2.1 (2.0)
Dur-10	1.6 (1.8)	1.9 (1.4)	2.0 (1.7)
Dur-15	2.2 (2.0)	2.7 (1.2)	2.1 (2.0)
Dur-20	2.7 (1.9)	3.1 (1.1)	2.1 (1.9)
P-5	3.5 (0.9)	3.7 (0.8)	2.1 (1.9)

Prescribed

Pre	2.1 (1.4)	1.3 (1.8)	1.6 (1.3)
Dur-5	1.3 (2.0)	1.5 (1.5)	1.9 (1.5)
Dur-10	1.2 (1.9)	1.4 (1.8)	1.9 (1.4)
Dur-15	1.9 (1.6)	2.1 (1.4)	1.9 (1.4)
Dur-20	2.9 (1.2)	2.4 (1.3)	2.0 (1.5)
P-5	2.9 (1.3)	2.7 (1.0)	1.7 (1.3)

Affect

Preferred

Pre	6.1 (1.7)	5.9 (1.9)	6.0 (1.6)
Dur-5	6.0 (1.6)	6.2 (1.0)	6.4 (1.6)
Dur-10	5.9 (1.2)	6.3 (1.2)	6.5 (1.6)
Dur-15	6.1 (1.4)	6.6 (1.5)	6.9 (1.4)
Dur-20	6.9 (1.4)	6.9 (1.4)	6.6 (1.5)
P-5	7.3 (1.4)	7.6 (1.0)	6.9 (1.2)

Prescribed

Pre	6.0 (1.9)	6.1 (1.9)	6.1 (1.2)
Dur	5.6 (1.2)	6.1 (1.0)	6.5 (1.0)
Dur-10	5.9 (1.5)	6.0 (1.6)	6.6 (1.2)
Dur-15	5.9 (1.3)	6.3 (1.5)	6.3 (1.3)
Dur-20	7.0 (1.3)	6.9 (1.8)	6.1 (1.5)
P-5	7.1 (1.2)	7.6 (1.1)	6.6 (1.4)

Activation

Preferred

Pre	4.0 (1.9)	3.8 (1.7)	4.3 (1.5)
Dur-5	5.7 (1.3)	5.0 (1.7)	4.2 (1.9)
Dur-10	6.2 (1.2)	5.7 (1.5)	3.9 (1.9)
Dur-15	6.7 (1.3)	6.3 (1.5)	3.4 (2.1)
Dur-20	6.7 (1.4)	6.6 (1.6)	3.7 (2.0)
P-5	5.4 (1.7)	5.2 (2.2)	3.3 (2.3)

Prescribed

Pre	4.2 (1.5)	3.8 (1.9)	3.9 (1.2)
Dur-5	5.9 (1.4)	5.9 (1.1)	4.1 (1.2)
Dur-10	6.1 (1.7)	6.5 (1.0)	4.0 (1.5)
Dur-15	6.5 (1.2)	6.9 (1.1)	3.9 (1.3)
Dur-20	7.0 (1.4)	6.9 (1.1)	3.7 (1.6)
P-5	5.9 (1.6)	5.6 (1.4)	3.8 (1.5)

Self-Efficacy

Preferred

Pre	83.8 (18.1)	95.1 (10.3)
P-5	97.3 (6.6)	96.8 (8.6)

Prescribed

Pre	75.9 (15.7)	81.8 (16.0)
P-5	91.9 (11.7)	90.2 (14.8)

RPE

Preferred

Dur-5	12.9 (1.8)	11.4 (2.1)
Dur-10	13.5 (1.8)	12.2 (2.0)
Dur-15	13.9 (1.8)	12.8 (2.1)
Dur-20	14.4 (1.8)	12.9 (2.2)

Prescribed

Dur-5	13.7 (1.5)	13.4 (1.7)
Dur-10	14.0 (1.9)	14.3 (1.7)
Dur-15	14.6 (1.9)	14.4 (1.5)
Dur-20	14.6 (1.9)	14.5 (1.6)

Heart Rate

Preferred

Pre	82.1 (8.4)	81.1 (7.5)	81.5 (7.4)
Dur-5	140.3 (13.9)*	128.0 (13.8)*	81.3 (7.7)
Dur-10	147.1 (14.2)*	134.8 (14.4)*	77.7 (7.0)
Dur-15	151.5 (14.3)*	138.1 (17.3)*	77.2 (7.8)
Dur-20	153.3 (12.0)*	138.1 (15.9)*	75.1 (7.4)#
P-5	99.5 (9.3)*	89.9 (10.9)*	76.2 (6.3)#

Prescribed

Pre	78.0 (9.3)	81.7 (9.1)	78.6 (13.3)
Dur-5	151.8 (9.8)**	151.9 (10.2)**	70.3 (9.7)#
Dur-10	159.8 (8.1)**	157.6 (9.1)**	70.1 (10.3)#
Dur-15	163.5 (7.6)**	159.1 (7.9)**	70.4 (10.8)#
Dur-20	163.0 (7.4)**	158.7 (8.4)**	71.8 (10.7) #
P-5	97.9 (9.9)**	97.2 (10.9)**	71.7 (9.0)#

* = significantly higher than baseline.

** = significantly higher than baseline and preferred.

= significantly lower than baseline.

analyses were found to exceed .75 and the location of significant mean differences were determined with Tukey's post-hoc tests. Results of univariate analyses demonstrated that state anxiety and the positive engagement, revitalization, and tranquility subscales of the EFI were responsible for the significant multivariate effect (see Table 4.2 and 4.3).

First, a significant main effect for Time, $F(5, 420) = 9.62, p < .001$, as well as a significant Condition \times Time interaction, $F(10, 420) = 3.10, p < .002$, were observed for state anxiety. Post hoc analyses revealed that state anxiety was increased significantly from baseline during the self-presentational exercise condition ($ES = .55$). Significant reductions in state anxiety emerged 5 min following exercise in both the self-presentational ($ES = -.61$) and laboratory ($ES = -.55$) conditions. The significant reduction persisted for 60 ($ES = -.73$) and 120 ($ES = -.78$) min following the laboratory condition. However, state anxiety returned to baseline by the 60 min post-exercise assessment interval ($ES = -.28$) following the self-presentational condition. No significant changes in state anxiety were detected following the quiet rest condition (see Figure 4.1). Thus, a significant elevation in state anxiety was only observed during exercise in the self-presentational condition. Furthermore, while decrements in state anxiety emerged immediately following exercise in both the self-presentational and laboratory conditions, this reduction persisted for 120 min following the laboratory exercise condition only.

Second, in regard to positive engagement, a significant Condition \times Time interaction, $F(5, 420) = 5.29, p < .001$, was observed. Post hoc analyses revealed significant elevations in positive engagement 5 min following exercise in the self-presentational ($ES = .40$) and laboratory ($ES = .39$) conditions. Concomitant to these

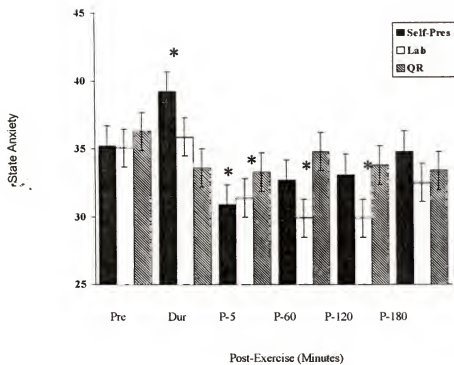


Figure 4.1. State anxiety responses during and following each condition

increases, positive engagement was found to decrease significantly during ($ES = -.47$) and 5 min following ($ES = -.47$) quiet rest. Although positive engagement had returned to baseline 60 min following both the self-presentational ($ES = .18$) and quiet rest ($ES = .21$) conditions, the significant elevation in positive engagement was found to persist through the 60 min ($ES = .74$) post-exercise assessment following the laboratory exercise condition (see Figure 4.2). Therefore, while positive engagement was significantly increased following both exercise conditions, a significant decrease in positive engagement was detected during and five min following the quiet rest condition. Nevertheless, when compared to the self-presentational condition, the increase in positive engagement persisted longer following exercise in the laboratory condition.

Third, in regard to revitalization, significant main effects for Condition, $F(2, 84) = 7.86, p < .001$, and Time, $F(5, 420) = 9.87, p < .001$, as well as a significant Condition x Time interaction, $F(10, 420) = 5.60, p < .001$, were detected. Post hoc analyses revealed significant elevations in revitalization during both the self-presentational ($ES = .75$) and laboratory ($ES = .78$) exercise conditions. The significant increases in revitalization were found to persist for 120 min following both exercise conditions. Moreover, revitalization was found to be significantly higher during and following exercise when compared to quiet rest. No significant changes in revitalization were detected within the quiet rest condition (see Figure 4.3). Therefore, improvements in revitalization were observed during and following both exercise conditions and feelings of revitalization associated with exercise were found to be significantly higher than those reported within the quiet rest condition.

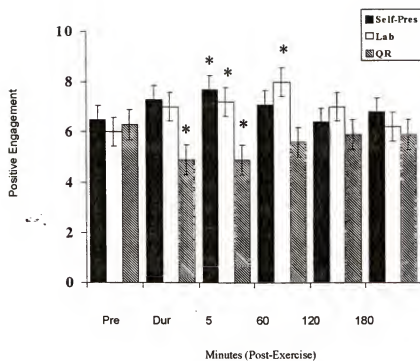


Figure 4.2. Positive engagement responses during and following each condition

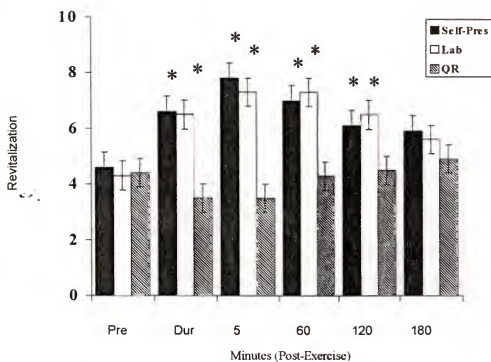


Figure 4.3 Revitalization responses during and following each condition

Fourth, in regard to tranquility, a significant main effect for Time, $F(5, 420) = 5.76$, $p < .001$, as well as a significant Condition x Time interaction, $F(10, 420) = 4.02$, $p < .001$, were detected. Post hoc analyses revealed a significant decrease in tranquility ($ES = -.56$) during the self-presentational exercise condition. Furthermore, a significant increase in tranquility ($ES = .61$) emerged 120 min following the laboratory exercise condition. No significant changes in tranquility were observed within the quiet rest condition (see Figure 4.4). Thus, while tranquility was decreased during the self-presentational exercise condition, a significant increase in tranquility emerged 120 min following the laboratory exercise condition.

Feeling Scale and Affect Grid Responses

Separate 2 (Intensity) x 3 (Condition) x 6 (Time) ANOVA's with Bonferroni corrections (significance level = .015) were employed to analyze the feeling scale and affect grid responses. Analyses of feeling scale responses yielded a significant main effect for Time, $F(5, 420) = 24.64$, $p < .001$, as well as a significant Condition x Time interaction, $F(10, 420) = 8.04$, $p < .001$. Post hoc analyses revealed a significant decrease in the feeling scale at 5 ($ES = -.40$) and 10 min ($ES = -.37$) during the self-presentational exercise condition. Nevertheless, this decrement was transient and feeling scale responses were found to be significantly higher than baseline at 20 min during ($ES = .48$) and 5 min post-exercise assessment intervals ($ES = .86$) within the self-presentational condition. Additionally, significant increases in the feeling scale were detected at 15 ($ES = .55$) and 20 ($ES = .86$) min during and 5 min following ($ES = 1.23$) the laboratory exercise condition. No significant changes were detected within the

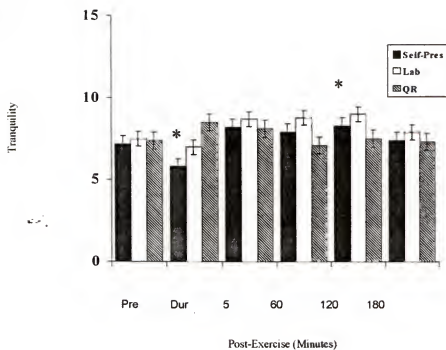


Figure 4.4. Tranquility responses during and following each condition

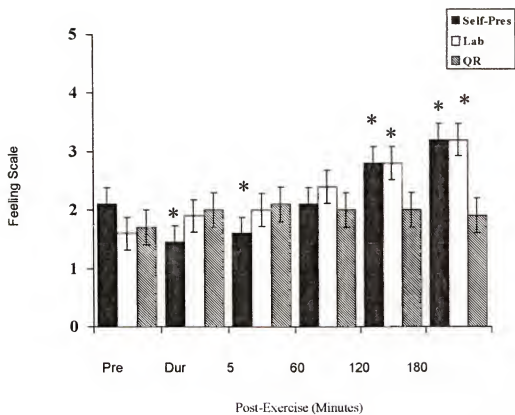


Figure 4.5 Feeling scale responses during and following each condition

quiet rest condition (see Figure 4.5). In summary, a significant decrease in the feeling scale was observed at 5 and 10 min during exercise in the self-presentational condition. However, this reduction did not persist and significant increases above baseline value emerged 20 min during and 5 min following the cessation of activity. In contrast to the self-presentational condition, only significant elevations in feeling scale responses were observed during (15 and 20 min) and 5 min following exercise in the laboratory condition.

Analyses of the valence dimension of the affect grid revealed a significant main effect for Time, $F(5, 420) = 16.02, p < .001$, as well as a significant Condition \times Time interaction, $F(10, 420) = 2.93, p < .002$. Post-hoc analyses demonstrated that affect was significantly higher than baseline 20 min during and 5 min following the self-presentational and laboratory conditions. No significant changes were detected within the quiet rest condition (see Figure 4.6). Therefore, valence improved significantly during (20 min) and 5 min following exercise in both environmental conditions, but remained unchanged within the quiet rest condition.

Data for the activation dimension of the affect grid failed to meet the assumption of sphericity (Epsilon = .69), thus the traditional F tests were computed using the Huynh and Feldt (1976) conservation degrees of freedom adjustment. Analyses of activation yielded significant main effects for Time, $F(5, 420) = 34.81, p < .001$, and Condition, $F(2, 84) = 21.80, p < .001$, as well as a significant Condition \times Time interaction, $F(10, 420) = 13.32, p < .001$. Post-hoc analyses revealed that activation was significantly higher than baseline value at all assessment intervals during exercise and this elevation persisted through the 5 min post-exercise assessment. Additionally, activation during and following

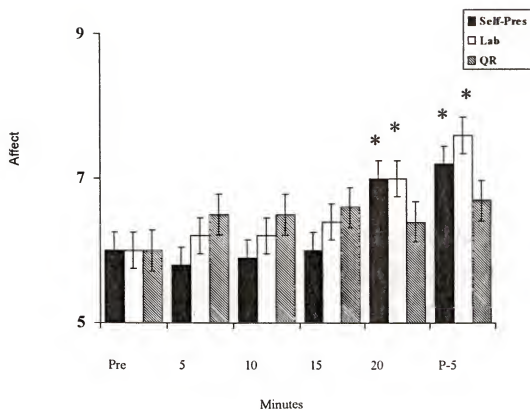


Figure 4.6. Valence responses during and following each condition

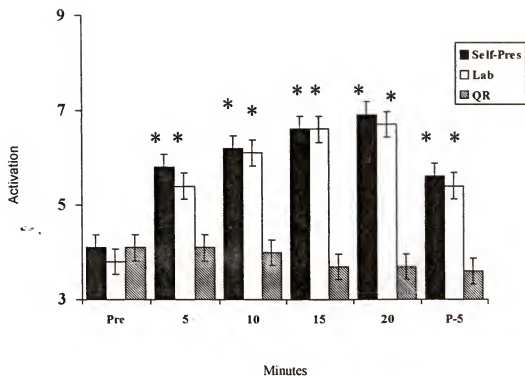


Figure 4.7. Activation responses during and following each condition

exercise was found to be significantly higher than activation during the quiet rest condition (see Figure 4.7). Therefore, exercise was associated with an increase in activation and feelings of activation were significantly higher during exercise when compared to quiet rest.

Self-efficacy. The internal consistency score of the self-efficacy scale was adequate within the present sample ($\alpha = .90$). A 2 (Intensity) \times 2 (Condition) \times 2 (Time) ANOVA with repeated measures on the Condition and Time factors was conducted to analyze self-efficacy. The ANOVA analysis yielded significant main effects for Time, $F(5, 415) = 49.35, p < .001$, and Intensity, $F(1, 57) = 7.10, p < .01$, as well as a significant Condition \times Time interaction, $F(10, 415) = 11.93, p < .001$. Post hoc analyses demonstrated that self-efficacy was significantly higher at baseline in the preferred intensity group ($ES = .69$). Additionally, self-efficacy significantly increased following both the self-presentational ($ES = 1.05$) and laboratory ($ES = .41$) exercise conditions (see Figure 4.8). Thus, while self-efficacy was higher in the preferred intensity group, significant increases were observed following both the laboratory and self-presentational exercise conditions.

Heart rate. A 2 (Intensity) \times 3 (Condition) \times 6 (Time) ANOVA with repeated measures on the Condition and Time factors was employed to analyze the heart rate responses. However, the heart rate data failed to meet the assumption of sphericity ($Epsilon = .58$), thus, the traditional F tests were computed using the Huynh and Feldt (1976) conservation degrees of freedom adjustment. Analyses of heart rate yielded

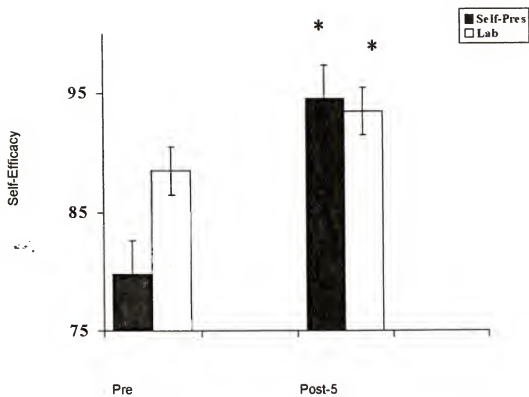


Figure 4.8. Self-efficacy responses during and following each condition

significant main effects for Time, $F(5, 420) = 781.06$, $p < .001$, Intensity, $F(1, 84) = 8.50$, $p < .001$, and Condition, $F(2, 84) = 389.89$, $p < .001$, as well as significant Intensity \times Time, $F(10, 420) = 11.55$, $p < .001$, Condition \times Time, $F(10, 420) = 231.40$, $p < .001$, and Intensity \times Condition \times Time, $F(10, 420) = 5.95$, $p < .001$ interactions. Post-hoc analyses demonstrated that heart rate was significantly higher than baseline at all time-points during and following each exercise session in both the prescribed and preferred intensity groups. Heart rate was also found to be significantly lower than baseline at all time-points during quiet rest within the prescribed group. Furthermore, significant reductions in heart rate were also observed 20 min during and 5 min following quiet rest in the preferred group. Finally, heart rate was found to be significantly higher at all time-points during exercise within the prescribed group when compared to the preferred group and higher at all time-points during both exercise conditions when compared with quiet rest (see Table 4.3). Therefore, heart rate was significantly higher during exercise in the prescribed intensity group and increases in heart rate were detected across time during exercise while decreases in heart rate were observed across time during quiet rest.

RPE. A 2 (Intensity) \times 2 (Condition) \times 4 (Time) ANOVA with repeated measures on the Condition and Time factors was employed to analyze the RPE responses. Significant main effects for Time, $F(3, 168) = 38.05$, $p < .001$, and Intensity, $F(1, 56) = 38.05$, $p < .01$ were found. The main effect for Condition and Intensity \times Condition interaction approached significance ($p < .10$). Post-hoc analyses revealed that, irrespective of exercise condition, RPE increased across time. Additionally, in comparison to preferred intensity exercise, RPE was significantly higher ($ES = .71$) during prescribed

intensity exercise. A trend towards increased RPE in the self-presentational environment was also observed. Specifically, while RPE did not differ between the self-presentational and laboratory condition within the prescribed group ($ES = .07$), the preferred intensity group's RPE was higher ($ES = .67$) during exercise in the self-presentational condition (see Figure 4.9). In summary, RPE was found to increase across time during exercise regardless of intensity or condition. Nevertheless, RPE was higher within the prescribed exercise group and a trend towards higher RPE during the self-presentational condition emerged within the preferred intensity group.

Regression analyses. It has been suggested that a reciprocal relationships exist between self-efficacy and in-task affective states (Bandura, 1997) and in-task affective states and post-exercise psychological responses (Rejeski et al., 1995; Treasure & Newberry, 1998). Recent research also suggests that this relationship is particularly salient during more intense bouts of physical activity (Treasure & Newberry, 1998). Consistent with previous research (Treasure & Newberry, 1998), these relationships were examined by conducting a series of hierarchical multiple regression analyses. The first series were undertaken to examine the influence of self-efficacy on in-task psychological states by controlling for pre-exercise efficacy within the preferred and prescribed intensity groups separately. The second series was conducted to examine the reciprocal determinism between in-task affect and psychological responses following exercise by controlling for in-task affective states and post-exercise psychological responses within each intensity condition. Although no significant findings emerged for the preferred intensity group, self-efficacy was found to be a significant predictor of in-task physical

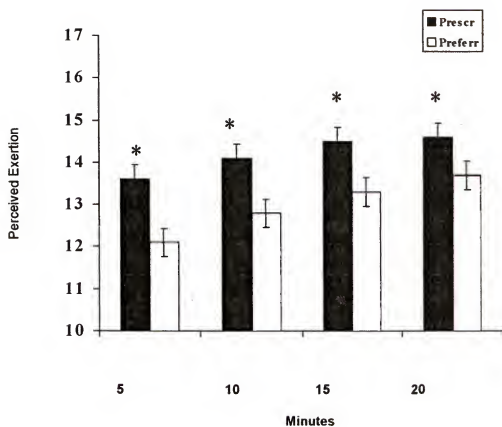


Figure 4.9. Perceived exertion responses within each group

exhaustion, $R^2 = .20$, Beta = $-.34$, and in-task tranquility, $R^2 = .22$, Beta = $.50$, during exercise for the prescribed intensity group. As indicated by the beta coefficient, lower levels of self-efficacy predicted elevated feelings of physical exhaustion and higher levels of self-efficacy predicted increased feelings of tranquility during exercise within the prescribed intensity group. The second series of analyses addressing the relationship between in-task affect and post-exercise psychological responses failed to yield any significant findings for either the prescribed or preferred intensity groups.

CHAPTER FIVE

DISCUSSION

Although physical activity has been advocated as an efficacious treatment strategy for the improvement and maintenance of psychological well-being (Morgan, 1997), knowledge of the factors which may moderate the exercise-affect relationship is limited (Gauvin & Spence, 1996). Despite the recent proliferation of research identifying both programmatic (i.e., exercise intensity and environment) and dispositional (i.e., psychological traits, fitness level) variables as cogent determinants of psychological responses to acute exercise (Breus & O'Connor, 1998; McAuley et al., 1996; Raglin & Wilson, 1996), a comprehensive understanding of the dose-response relationship between exercise and psychological well-being remains elusive.

In his seminal review of the dose-response literature, Rejeski (1994) proposed that affective responses during and following acute exercise emanate from a unique interaction between an individual's psychological disposition and the social, physiological, and perceptual factors which constitute the session. Nevertheless, examination of the exercise psychology literature reveals few investigations which have attempted to elucidate the relationship among the aforementioned moderator variables. By employing Rejeski's dose-response model as a theoretical foundation, the present investigation examined the

extent to which a subtype of social anxiety (SPA), interacts with the socially evaluative nature of the exercise environment and exercise intensity to influence psychological responses during and following acute bouts of aerobic exercise. The discussion has been divided into five primary sections. The first section of the chapter addresses the efficacy of the environmental and intensity manipulations. Next, the psychological responses to the self-presentational and laboratory exercise conditions are discussed. The third section reviews the psychological responses following the quiet rest condition. In the fourth section, the psychological responses following exercise in each of the intensity groups are discussed. Finally, the implications of the findings for the exercise-affect relationship, adherence to habitual physical activity, and health behavior will be advanced.

Experimental Manipulations

The objective of the experimental design was to create exercise conditions which differed in both level of physical exertion as well as the perceived potential for negative physique evaluation. It was found that heart rate and RPE were significantly higher during the prescribed intensity exercise sessions. Furthermore, participants in each intensity group rated the self-presentational condition as the most stressful environment from a physique evaluation perspective. Thus, the prescribed intensity exercise conditions were perceived to be more physically demanding and the self-presentational condition was associated with greater perceptions of physique related stress. Therefore, it can be concluded that the experimental manipulations were successful and the psychological responses observed following each condition will be addressed within this context.

Psychological Responses Following the Exercise Conditions

It was hypothesized that participants would experience greater improvements in psychological states following acute exercise performed in the laboratory condition. That is, due to high SPA females' fear of socially evaluative settings (Hart et al., 1989; Katula et al., 1998), they would report more negative in-task psychological responses during exercise in the self-presentational condition. Consequently, provided that in-task affective states have been predictive of post-exercise affective responses in previous research (Rejeski et al., 1995; Treasure & Newberry, 1998), it was expected that positive changes in state anxiety and feeling states would not emerge following the self-presentational condition. Results of the present investigation provided partial support for these hypotheses.

Improvements in state anxiety and feeling states (revitalization, positive engagement, feeling scale, and valence) were observed 5 min following exercise in both the self-presentational and laboratory exercise conditions. A significant increase in tranquility was only detected 120 min following the laboratory condition. Nevertheless, while the improvements in psychological states following the self-presentational exercise condition returned to baseline by the 60 min post-exercise assessment, the positive changes were found to persist through the 120 min post-exercise assessment following the laboratory condition. Thus, improvements in psychological states endured longer following exercise in the laboratory condition. The only feeling state not to demonstrate this same pattern was revitalization. Significant increases in revitalization were observed during and following exercise in both conditions. Furthermore, perceptions of

revitalization were found to persist for 120 min following each exercise condition. Thus, in contrast to state anxiety and positive engagement, acute exercise is associated with elevations in the perception of revitalization, regardless of the environment in which the session is performed. This finding indicates that increases in the perception of energetic arousal (e.g., revitalization) can occur concomitantly with decrements in other psychological states such as anxiety. Additionally, it also provides support for the contention that the interpretation of the exercise stimulus is of paramount importance for changes in psychological well-being. That is, while increases in revitalization were demonstrated during both exercise conditions, those feelings of energetic arousal were accompanied by elevations in anxiety and negative affect during only the evaluative environment. Thus, if certain aspects of the exercise stimulus are perceived as threatening, it appears that perceptions of increased energy and anxiety can manifest simultaneously. Additional inquiry, however, is needed to substantiate the present assertion and delineate the nature of the interaction between positive and negative affective responses during acute exercise.

These findings are generally consistent with results obtained within the pilot study and previous research (Bozoian et al., 1994; Gauvin & Rejeski, 1993; Rejeski et al., 1995). There are, however, a few important exceptions which warrant further discussion. Specifically, McAuley and colleagues (1996) reported no significant differences in state anxiety responses during or following acute exercise performed in a laboratory or naturalistic exercise environment. It is important to note that the participants in the McAuley et al. (1996) study were non-anxious individuals. Thus, it is possible that such

participants would perceive neither a laboratory nor a naturalistic exercise environment as threatening. Indeed, inspection of the McAuley et al. (1996) participants' in-task state anxiety responses revealed no significant changes during exercise. Nevertheless, in the present investigation, participants rated the self-presentational condition as a stressful environment and consequently demonstrated increased state anxiety and decreased tranquility during exercise. Thus, consistent with theories of stress (Lazarus & Opton, 1966; Spielberger et al., 1983) and the self-presentational perspective (Leary, 1983), women with high SPA reported an increase in the perception of stress related emotions during exercise within a setting with the potential for physique evaluation. Additionally, while the self-presentational condition was associated with elevations in negative affect during activity, the improvement in psychological states following the condition were more transient than those observed following the laboratory condition. This finding could also be interpreted as support for the Rejeski et al. (1995) contention that in-task affective states are predictive of post-exercise improvements in psychological well-being.

Additionally, given the ambiguous findings evident in prior research (Bozoian et al., 1994; Gauvin & Rejeski, 1993; Turner et al., 1997), the observation of an increase in positive engagement following both the self-presentational and laboratory exercise conditions is also of interest. Results of previous research suggest that greater increases in positive engagement are exhibited following acute exercise performed in group settings (Bozoian et al., 1994; Gauvin & Rejeski, 1993; Turner et al., 1997). This finding has led some researchers to conclude that feelings of positive engagement are sensitive to the social context of exercise environments (Gauvin & Rejeski, 1993; Gauvin & Spence,

1995). However, it is unclear if the participants in this previous research viewed the public exercise setting as enjoyable or threatening. Therefore, when considering that participants in the present study perceived the self-presentational condition as threatening, it is possible that the increase in positive engagement observed following acute exercise in prior investigations may have been attenuated by the high SPA females' apprehension regarding negative social evaluation.

Because improvements in psychological well-being were observed 5 min following both exercise conditions, it could be concluded that women with high SPA experience positive changes in psychological states following acute exercise irrespective of the socially evaluative nature of the environment. Furthermore, from an exercise prescription standpoint, one could also contend that, while both exercise sessions are beneficial for psychological well-being, the laboratory is the superior condition since the improvements persisted for a longer duration. However, it is important to note that the stressful rating ascribed to the self-presentational condition and divergent in-task state anxiety and feeling state responses suggest that the psychological responses observed 5 min following the self-presentational and laboratory conditions emerged from different interpretations of the exercise stimulus. For example, while an increase in state anxiety and decrease in both tranquility and the feeling scale were observed within the self-presentational condition, no significant elevations in negative affect emerged during the laboratory condition.

Given the concordance of the in-task psychological response and subjective stress ratings, it is reasonable to speculate that the improvements in psychological well-being exhibited 5 min following the self-presentational condition reflects relief at exiting the

evaluative environment rather than enjoyment of the exercise session. Furthermore, the divergent pattern of psychological responses following each condition (i.e., the greater persistence following the laboratory condition) provide support for the assertion that in-task affective states are predictive of post-exercise improvements in psychological well-being. The contention that each exercise condition is beneficial for the amelioration of psychological states would be misleading. Therefore, the in-task and stress rating responses suggests that exercising in a private, non-evaluative setting is superior to an evaluative setting for the improvement of psychological states within high SPA women.

Rejeski and Ribisl (1980) suggested that psychological influences on RPE are most pronounced during less intense bouts of physical activity. In support of this assertion, Boutcher and colleagues (1988) reported that self-presentational factors only impacted RPE during moderate intensity exercise. Consistent with each of these findings, RPE was higher within the self-presentational condition for the preferred intensity group only. Thus, despite the fact that intensity was self-selected, exercise was perceived to be more physically demanding within the socially evaluative exercise setting. Although the mechanism responsible for this finding is not clear at the present time, it is possible that the negative affect demonstrated during the self-presentational made the participants perceive the exercise session as more strenuous.

However, factors other than the increase in negative affect may have been influential in the differential RPE responses. For example, Baumeister (1982) proposed that pleasing the audience and maintaining consistency of one's public self with one's desired self are the two primary motives of self-presentation. In accordance with this

theoretical position, the elevated perception of effort during the self-presentational condition may be attributable to a social facilitation effect. That is, given the participants' low levels of habitual physical activity, it is possible that other more active exercisers may have been working out at a visibly greater level of intensity. Engaging in a behavior inconsistent with those being displayed by others in a social situation heightens the likelihood of an undesirable social response (Leary, 1983). Thus, it is reasonable to speculate that the high SPA participants adjusted their effort in an attempt to conform with the intensity level they perceived to be the norm for the other exercisers in the facility. Although this assertion is speculative, the influence of SPA on the perception of effort is important to the understanding of the mental health benefits of exercise and thus, warrants further investigation.

Psychological Responses Following Quiet Rest

It was hypothesized that both aerobic exercise and quiet rest would be associated with improvements in psychological well-being. However, based on the results of the pilot study and those reported in previous research (Garvin et al., 1998; Raglin & Morgan, 1987), it was anticipated that increases in positive affect would not emerge following quiet rest and the improvements in quiescent psychological states (i.e., state anxiety and tranquility) would persist longer after exercise.

The results of the present study provide partial support for these hypotheses. No significant changes in state anxiety or feeling states emerged following the quiet rest condition. Considering this finding in conjunction with the results of the pilot study, quiet rest appears to have little beneficial impact upon feeling states such as positive

engagement and revitalization. Nevertheless, there is no clear answer for the absence of improvements in quiescent psychological states. It is important to note that while quiet rest has been associated with reductions in state anxiety previously (Breus & O'Connor, 1998; Raglin & Morgan, 1987), others have failed to detect such improvements (Bartholomew, 1999; McAuley et al., 1996). In accordance with these ambiguous findings, the veracity of the distraction hypothesis has been questioned (Bartholomew & Linder, 1998). Recently, it has been suggested that the reductions in state anxiety which accompany passive quiet rest interventions represent a decrease in arousal laden items of the STAI (Ekkekakis et al., 1999; McAuley et al., 1996) or simply reflect a return to baseline anxiety level (Bartholomew, 1999). The present findings neither support nor refute these assertions. Thus, while the results fail to provide support for the distraction hypothesis, it is possible that other theoretical positions more accurately reflect the changes in psychological states following exercise and quiet rest. Specifically, it is possible that the divergent findings evident in the previous literature are attributable to the fact that quiet rest may only be efficacious for the reduction of certain types of stress symptoms. For example, the specific effects hypothesis (Davis, Eshelman, & McKay, 1985) proposes that passive behavioral therapy techniques such as meditation or quiet rest have the greatest effectiveness in the alleviation of cognitive stress symptoms while exercise would be a more efficacious intervention for the treatment of somatic symptoms.

Such a taxonomy is consistent with the conceptual underpinnings of the matching hypothesis (Smith & Sechrest, 1991) and further inquiry regarding the matching of behavioral therapy interventions to specific stress symptoms is necessary to validate this

assertion. Furthermore additional investigations with similar objectives are needed to delineate the advantages and limitations of exercise and quiet rest for the improvement of stress related emotions. Therefore, although the present findings fail to support the distraction hypothesis, the evidence does suggest that acute exercise is beneficial for the improvement in psychological states and further inquiry addressing the veracity of the specific effects hypothesis for behavioral therapy interventions is recommended.

Psychological Responses Following Exercise in the Intensity Groups

It was hypothesized that improvements in psychological well-being would be greater following acute exercise performed at a self-selected intensity. This hypothesis was based upon the mounting evidence which indicates that improvements in psychological states are optimized following less intense bouts of physical activity (Berger & Owen, 1992; Focht & Koltyn, 1999; Katula et al., 1999; Steptoe & Cox, 1990; Treasure & Newberry, 1998). Although the mechanisms underlying this dose-response relationship remain unclear, it has been speculated the unfamiliar respiratory symptoms which accompany high intensity bouts of exercise produce physical discomfort that precipitates increased mood disturbance (Raglin & Wilson, 1996; Steptoe & Cox, 1990) and decreased confidence to successfully complete the exercise session (Treasure & Newberry, 1998).

The observation of higher RPE and lower self-efficacy during exercise in the prescribed intensity group suggest that in-task responses followed the predicted direction. Nevertheless, post-exercise psychological responses did not differ as a function of exercise intensity. Thus, the present findings failed to support the hypothesis. When considering

that women with high SPA have reported increased stress and lower self-efficacy in the socially evaluative settings (Hart et al., 1989; Katula et al., 1999), it is reasonable to speculate that the interaction among SPA and socially evaluative nature of the self-presentational exercise condition may have negated the expected effects of the intensity manipulation upon the psychological responses. For example, Bain and colleagues (1989) found that overweight women reported anxiety associated with the prospect of negative social evaluation as the most pronounced deterrent to exercising in public. In fact, one participant described the intense embarrassment she perceived at the prospect of having other exercisers view her "huffing and puffing" as the primary motive for avoiding public exercise settings. Thus, for women with high SPA, discomfort may not emanate directly from the exertional symptoms of exercise, but rather from the fear that others will notice these symptoms and respond with derision. When considering this assertion in conjunction with the findings of the present study, it is reasonable to suggest that the prospect of negative physique evaluation is a more salient determinant of in-task and post-exercise psychological responses than the physical symptoms which accompany more intense exercise for females with high SPA.

Although psychological responses did not differ significantly as a function of intensity, the finding that self-efficacy significantly predicted in-task feeling states within the prescribed intensity group should not be overlooked. In agreement with the results of regression analysis from previous research (Treasure & Newberry, 1998), lower baseline self-efficacy predicted increased perceptions of physical exhaustion and higher self-efficacy was associated with increased feelings of tranquility during higher intensity bouts of

exercise. Because this relationship was restricted to the prescribed (i.e., higher) intensity exercise sessions, the present findings provide support for Bandura's (1997) assertion that the relationship between self-efficacy and affect is strongest when the activity is more challenging. Because lower self-efficacy was associated with increased negative affect (i.e., physical exhaustion) during the high intensity exercise only, it would appear that the preferred intensity exercise may be more beneficial for the alleviation of stress-related emotions given that it was not linked to negative in-task psychological states.

Conclusions, Implications, and Recommendations for Future Inquiry

In summary, the primary contribution of the present investigation to the literature is the observation that the exercise environment is a salient determinant of the dose-response relationship between acute exercise and improvements in psychological well-being. Specifically, exercise settings differing in the prospect for negative physique evaluation are associated with divergent in-task and post-exercise psychological responses within high SPA, low active females. Therefore, the present results are consistent with the contentions of Rejeski (1994) and McAuley et al. (1996) who suggest that the exercise environment is an prominent determinant of the dose-response effects of exercise. However, while previous investigations have indicated that the social context inherent to public exercise settings is necessary for the derivation of improvements in psychological well-being (Gauvin & Rejeski, 1993), the results of the present study suggest that environments with the prospect of negative social evaluation are not beneficial for high SPA females. Thus, in the present investigation, the self-presentational condition was associated with greater perceptions of negative affect during exercise and less positive

psychological states following the cessation of activity. Additionally, while significant improvements in state anxiety and feeling states were observed 5 min following exercise in both the self-presentational and laboratory conditions, the positive changes in psychological states persisted longer following exercise in the laboratory condition. Given that females with high SPA experienced increased psychological distress within the self-presentational condition, the present findings possess implications for both the exercise-affect relationship and adherence to habitual physical activity.

Self-efficacy has been linked with improvements in psychological well-being and evidence from previous research suggests that evaluative exercise environments exert a deleterious influence upon this construct (Katula et al., 1998). The present results support Katula and colleagues (1998) contention and extends this finding to include additional aspects of psychological well-being. Consistent with the tenets of self-presentational theory, the present findings indicate that the efficacy information high SPA females derive from evaluative exercise settings lead to reduced self-efficacy and elevated mood disturbance. Therefore, because exercise in the laboratory setting was associated with more positive in-task and post-exercise psychological responses, it is reasonable to suggest that high SPA women exercising for the purpose of stress reduction may gain the greatest benefit from physical activity which is performed in non-evaluative settings.

Provided with the negative impact of self-presentational exercise settings upon self-efficacy and psychological well-being, it is possible that exercising in socially evaluative environments may demotivate high SPA women from adopting or maintaining regular physical activity. Therefore, the present findings also provide support for Leary's

(1992) assertion that environments which emphasize self-presentational qualities may cause those women who need to exercise the most to abstain from exercise participation in public settings. Thus, from an exercise adherence perspective, it may be advantageous for high SPA women to exercise within, private, non-evaluative environments. Such a strategy may be of particular value during the adoption phase of activity. That is, beginning physical activity in a setting without mirrors or other exercisers would allow high SPA women to avoid exposure to potentially demotivating efficacy information while simultaneously providing the opportunity to enhance the perception of their current physical appearance and exercise abilities. Indeed, there is ancillary evidence supporting this contention. Treasure et al. (1997) found high SPA to be associated with lower exercise adherence during a 12 week walking program. Furthermore, when compared to a supervised group exercise program, Perri and colleagues (1997) reported greater exercise participation during a home-based exercise training program within a sample of obese women. Although the evaluative nature of the exercise environment may serve as an influential factor, exercise behaviors are determined by the complex interaction of a constellation of variables (Dishman & Buckworth, 1998). Thus, it is unlikely that the modification of the exercise environment alone would result in a pronounced improvement in exercise adherence. Nevertheless, the observation of a relationship between SPA and anxiogenesis within the self-presentational exercise condition suggest that the evaluative nature of exercise settings has the potential to exert a deleterious impact upon adherence to physical activity and this relationship warrants further inquiry.

Consistent with the findings of the pilot study, mean values for percent body fat and body mass index were found to be congruous with age related normative values. Thus, despite anthropometric measurements which are characterized as healthy, high SPA women maintain excessive levels of anxiety regarding the appearance of their physique. It is difficult to identify the specific mechanisms which give rise to SPA within young, healthy females. Nevertheless, it is reasonable to suggest that social pressure to conform with unrealistic media depictions of the contemporary female physique may serve as one contributing factor to the prevalence of body image disturbance. In accordance with the implications that physique related concerns may possess for genesis of pathological health behaviors (e.g., eating disorder symptomatology), additional research examining the role of exercise in the alleviation of SPA is warranted.

The findings of the current investigation contribute knowledge which will assist in the development of a comprehensive dose-response model for the psychological beneficence of physical activity. One of the most pertinent findings of the present investigation was the divergent in-task psychological responses exhibited during the different exercise environments. That is, psychological responses during exercise were found to be dynamic and shift as a function of the socially evaluative nature of the setting. It is reasonable to contend that such changes would be impacted by other programmatic factors as well. The most salient factor, from a dose-response perspective, may be exercise duration. Indeed, while short bouts of physical activity have been advocated for the amelioration of physical health (USDHHS, 1996), knowledge pertaining to the psychological beneficence of brief bouts of exercise remains limited. It may be

advantageous to introduce high SPA women to public exercise settings through short bouts of exercise. Utilizing brief exercise bouts during the early stages of an exercise training program could serve to gradually inoculate the participants to the socially evaluative nature of the environment and make exercising in public more comfortable. Although use of such a strategy is intuitively appealing, empirical evidence is needed to examine the veracity of this contention. Thus, given the established health benefits of shorter duration bouts of exercise, further examinations of the interaction between exercise duration and self-presentational concerns are needed.

The influence of additional programmatic factors require further inquiry as well. Despite the fact that exercise intensity did not significantly alter psychological responses in the present investigation, it may be a salient determinant of exercise-induced improvements in psychological well-being under other conditions. While the intensity manipulation was successful for the purposes of the present investigation, it is important to note that intensity was quantified using an indirect method. Thus, additional research incorporating reliable and valid measure of exercise intensity (i.e., percentage of VO₂ maximum) is needed to substantiate the findings.

The present results indicate that the socially evaluative nature of the exercise environment influences psychological well-being during and following acute exercise. Nevertheless, this conclusion is based upon self-reported measures of affect which possess the inherent limitation of being susceptible to the influence of demand characteristics or behavioral artifacts. Thus, despite attempts to minimize the impact of such considerations, their influence cannot be entirely discounted in studies of this nature. However, if the

evaluative nature of the exercise environment was found to influence psychophysiological measures of human emotion in a similar manner, the impact of demand characteristics upon the present results could be delineated. Therefore, it is recommended that future examinations of the exercise environment's impact upon changes in psychological states incorporate both self-report and behavioral (i.e., acoustic startle eyeblink response) measures of emotion.

Provided that the ecological validity of many previous exercise-affect studies has been challenged (Gauvin & Rejeski, 1993), the importance of the signal contingent assessment procedure should also be acknowledged. For example, many previous investigations have assessed psychological states following exercise during a period of seated rest in a laboratory setting (Breus & O'Connor, 1998; Petruzzello & Tate, 1995; Raglin & Wilson, 1996). While this methodology provides additional control over potential confounds, it does not adequately simulate people's typical exercise behavior. Additionally, the procedure of assessing psychological states during seated rest may serve as a confound itself given that quiet rest has been associated with anxiolytic benefits (Raglin & Morgan, 1987; Youngstedt et al., 1998). The finding that improvements in psychological states are maintained following the resumption of typical daily activity suggests that experiential sampling methods such as the signal contingent technique possess both methodological and applied implications. Therefore, in order to further delineate the role of exercise in psychological well-being, it is recommended that future investigations of the exercise-affect relationship incorporate more ecologically valid assessment techniques such as the signal contingent methodology.

Self-presentational physique concerns are particularly prevalent within young women (Leary et al., 1994; Silberstein et al., 1985). Thus, while the use of a sample composed of young females represents a strength of the present investigation, it would be inappropriate to generalize the findings to male or elderly portions of the population. Furthermore, because the sample exhibited anthropometric characteristics consistent with normative values, the findings should not be generalized to obese individuals as well. When considering the implications of the results for health behavior, it is recommended that future researchers attempt to extend these findings to the aforementioned population subgroups.

In conclusion, it was found that the socially evaluative nature of the exercise environment influences psychological responses during and following an acute bout of exercise within women characterized by high SPA. Although it is necessary to substantiate these conclusions within other population subgroups, the findings provide additional knowledge of the factors which moderate the dose-response effects of acute exercise on psychological well-being and contribute to a more comprehensive understanding of the psychological beneficence of physical activity.

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APPENDIX A
INFORMED CONSENT DOCUMENT

To: Volunteers for the Aerobic Exercise Study

From: Brian C. Focht, Doctoral Student
Department of Exercise and Sport Sciences
College of Health and Human Performance
Office 114 Florida Gymnasium
(352) 392 - 0580 Ext. 253

RE: Informed Consent

The purpose of this statement is to summarize the study we are conducting, explain what we are asking you to do, and assure you that all information collected in the study will be treated confidentially to the extent provided by law. We wish to assure you that all participants in the study will be assigned a coded number; individuals will not be identified by name but by the last four digits in their parents phone number; all data will be treated in strict confidence and will be locked in a filing cabinet in the exercise psychology laboratory located at Room 144 Florida Gymnasium.

We are interested in examining the influence of aerobic exercise on emotional and physiological factors. Prior to the beginning of session one you will be requested to complete a medical history questionnaire. If you have a prior history of high blood pressure, undergone major surgery within the last six months, or are currently taking any anti-depressant or anti-anxiety medications you will be unable to participate in this study. Individuals who volunteer for this study will be asked to participate in three sessions. Two of the sessions will involve the performance of a 20-minute aerobic exercise workout on a stationary cycle. During each exercise session you may be asked to perform stationary cycling using either a prescribed or self-selected level of exertion. The prescribed level of exertion will be based on age-predicted maximum heart rate and will be similar to the level of exertion typically prescribed in fitness facilities. Exercise sessions will be completed in either the exercise psychology laboratory or the Living Well exercise facility. During the other session, you will sit in a quiet room free of distractions and read or study for 20-minutes. Your heart rate will be monitored throughout each session. You will be asked to complete four questionnaires prior to, during, and 5-minutes following each session. At this time you will be free to leave the laboratory, but you will be requested to take a packet of questionnaires and pager with

you. Three times during the four hour period following the completion of each session you will receive a pager tone instructing you to complete an assessment. Each assessment performed outside of the laboratory consists of the completion of two questionnaires and will require approximately 5 minutes to complete. Each session will last approximately thirty minutes. The total time commitment for the study, including the completion of questionnaires outside of the laboratory, is approximately two hours and fifteen minutes. If you are interested in having your body fat percentage measured, you will also have the opportunity to receive a free body composition assessment following the completion of the study. You will receive compensation in the form of up to 2% added to your final grade. This compensation is accumulated through the provision of .67 points of extra credit for each session attended. You are free to discontinue your involvement in the study at any time without consequence. This protocol only asks the participants to assume no more than the minimal amount of risk that is involved in the performance of any type of recreational exercise session. Furthermore, you will be performing aerobic exercise which has been associated with numerous physical benefits and this study is designed to better understand the possible emotional benefits of exercise.

It is our hope that you will agree to take part in this study. Without the cooperation of volunteers such as yourself, projects of this type would not be possible. Please ask any questions you may have at this time, and if you have any additional questions or concerns during the course of the study, please call me at (352) 392 - 0580 Ext. 253 or my faculty advisor, Dr. Hausenblas, at 392-0584 Ext. 292. Questions or concerns about research participants' rights may be directed to the UFIRB Office, Box 112250, University of Florida, Gainesville, FL 32611-2250 (352) 392-0433.

If you have no further questions at this time, and if you agree to volunteer for this study, please read the following statement and sign your name in the signature blank below.

I have read the procedure described above. I voluntarily agree to participate in the procedure, and I have received a copy of this description.

Participant's Signature:

Date:

Principal Investigator's Signature:

APPENDIX B
PRE-SCREENING INVENTORIES

For each of the following items, please indicate the degree to which the statement is characteristic or true of you using this scale. Please place your answer in the blank space provided after each question.

- 1 = not at all characteristic
 2 = slightly characteristic
 3 = moderately characteristic
 4 = very characteristic
 5 = extremely characteristic

1. I wish I wasn't so uptight about my physique/figure. _____
2. There are times when I am bothered by thoughts that other people are evaluating my weight or muscular development negatively. _____
3. Unattractive features of my physique/figure make me nervous in certain social settings. _____
4. In the presence of others, I feel apprehensive about my physique/figure. _____
5. I am comfortable with how fit my body appears to others. _____
6. It would make me uncomfortable to know others are evaluating my physique/figure. _____
7. When it comes to displaying my physique/figure to others, I am a shy person. _____
8. I usually feel relaxed when it is obvious that others are looking at my physique/figure. _____
9. When in a bathing suit, I often feel nervous about the shape of my body. _____

Leisure-Time Exercise Questionnaire

Considering a typical week (7 days), please write in the number of times on average you perform the following kinds of exercise for more than 20 minutes during your free time.

When answering please remember to;

- consider a typical week
- only count sessions 20 minutes in duration
- only count sessions done during free time
- note the main difference between the three kinds of exercise is the amount of effort required

_____ Strenuous Exercise - heart beats rapidly (running, jogging, vigorous swimming, aerobics, heavy weight training)

_____ Moderate Exercise - not exhausting, light sweating (fast walking, baseball, easy bicycling, easy swimming)

_____ Mild Exercise - minimal effort (easy walking, yoga, archery, fishing, bowling).

APPENDIX C
PSYCHOLOGICAL INVENTORIES

State Anxiety Inventory

1. I feel calm	1	2	3	4
2. I feel secure	1	2	3	4
3. I am tense	1	2	3	4
4. I am strained	1	2	3	4
5. I feel at ease	1	2	3	4
6. I feel upset	1	2	3	4
7. I am worrying over possible misfortunes	1	2	3	4
8. I feel satisfied	1	2	3	4
9. I feel frightened	1	2	3	4
10. I feel comfortable	1	2	3	4
11. I feel self-confident	1	2	3	4
12. I feel nervous	1	2	3	4
13. I am jittery	1	2	3	4
14. I feel indecisive	1	2	3	4
15. I am relaxed	1	2	3	4
16. I feel content	1	2	3	4
17. I am worried	1	2	3	4
18. I feel confused	1	2	3	4
19. I feel steady	1	2	3	4
20. I feel pleasant	1	2	3	4

Trait Anxiety Inventory

- | | | | | |
|---|---|---|---|---|
| 1. I feel pleasant | 1 | 2 | 3 | 4 |
| 2. I feel nervous and restless | 1 | 2 | 3 | 4 |
| 3. I feel satisfied with myself | 1 | 2 | 3 | 4 |
| 4. I wish I could be as happy as others seem to be | 1 | 2 | 3 | 4 |
| 5. I feel like a failure | 1 | 2 | 3 | 4 |
| 6. I feel rested | 1 | 2 | 3 | 4 |
| 7. I am calm, cool, and collected | 1 | 2 | 3 | 4 |
| 8. I feel that difficulties are piling up so that I cannot
over come them | 1 | 2 | 3 | 4 |
| 9. I worry too much over something that doesn't
really matter | 1 | 2 | 3 | 4 |
| 10. I am happy | 1 | 2 | 3 | 4 |
| 11. I have disturbing thoughts | 1 | 2 | 3 | 4 |
| 12. I lack self-confidence | 1 | 2 | 3 | 4 |
| 13. I feel secure | 1 | 2 | 3 | 4 |
| 14. I make decisions easily | 1 | 2 | 3 | 4 |
| 15. I feel inadequate | 1 | 2 | 3 | 4 |
| 16. I am content | 1 | 2 | 3 | 4 |
| 17. Some unimportant thought runs through my mind
and bothers me | 1 | 2 | 3 | 4 |
| 18. I take disappointments so keenly that I can't put
them out of my mind | 1 | 2 | 3 | 4 |
| 19. I am a steady person | 1 | 2 | 3 | 4 |
| 20. I get in a state of tension or turmoil as I think over
my recent concerns or interests | 1 | 2 | 3 | 4 |

Instructions: Please use the following scale to indicate the extent to which each word below described how you feel at this moment in time. Record your answer in the blank space provided.

- | |
|------------------------|
| 0 = Do Not Feel |
| 1 = Feel Slightly |
| 2 = Feel Moderately |
| 3 = Feel Strongly |
| 4 = Feel Very Strongly |

1. Refreshed _____
2. Calm _____
3. Fatigued _____
4. Enthusiastic _____
5. Relaxed _____
6. Energetic _____
7. Happy _____
8. Tired _____
9. Revived _____
10. Peaceful _____
11. Worn-out _____
12. Upbeat _____

Using the scale below, please indicate how **confident** you are **that you can successfully carry out each of the activities listed below:**

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
No Confidence at All					Somewhat Confident					Completely Confident

For example, if you feel complete confidence that you can cycle on the ergometer at 70-80% of your heart rate maximum, you would write 100%. However, if you are not confident at all that you could cycle at that pace for 20 minutes, you would write 0%

I BELIEVE THAT I CAN CYCLE ON THE ERGOMETER:

- _____ % 1. For 5 minutes at 70-80% of my heart rate maximum without stopping.
- _____ % 2. For 10 minutes at 70-80% of my heart rate maximum without stopping.
- _____ % 3. For 15 minutes at 70-80% of my heart rate maximum without stopping.
- _____ % 4. For 20 minutes at 70-80% of my heart rate maximum without stopping.

Using the scale below, please indicate how **confident** you are **that you can successfully carry out each of the activities listed below:**

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
No Confidence at All				Somewhat Confident				Completely Confident		

For example, if you feel complete confidence that you can cycle on the ergometer at a self-selected intensity, you would write 100%. However, if you are **not** confident at all that you could cycle at that pace for 20 minutes, you would write 0%

I BELIEVE THAT I CAN CYCLE ON THE ERGOMETER:

- _____ % 1. For 5 minutes at a **self-selected** intensity without stopping.
- _____ % 2. For 10 minutes at a **self-selected** intensity without stopping.
- _____ % 3. For 15 minutes at a **self-selected** intensity without stopping.
- _____ % 4. For 20 minutes at a **self-selected** intensity without stopping.

Using the scale below, please indicate how you feel **right now, at this moment**

-5	-4	-3	-2	-1	0	1	2	3	4	5
very bad		bad		fairly bad	neutral	fairly good		good		very good

PERCEIVED EXERTION SCALE

144

- | | |
|----|--------------------|
| 6 | No exertion at all |
| 7 | |
| | Extremely light |
| 8 | |
| 9 | Very light |
| 10 | |
| 11 | Light |
| 12 | |
| 13 | Somewhat hard |
| 14 | |
| 15 | Hard (Heavy) |
| 16 | |
| 17 | Very hard |
| 18 | |
| 19 | Extremely hard |
| 20 | Maximal exertion |

Behavioral Questionnaire

Directions: Please answer the following questions pertaining your daily activity.

1) Please check what activity were you involved in when the pager tone was received?

In class _____

Studying _____

Reading _____

Sleeping _____

Other _____

If you checked "Other", please describe the activity

2) Is your answer to #1 a common daily activity for you?

Yes _____


No _____

3) If you answered no to #2, please describe why you chose to participate in this activity today

BIOGRAPHICAL SKETCH


Born on April 6, 1972, Brian Carl Focht was raised by his parents, Reverend David and Eleanor Focht, in Kutztown, Pennsylvania. Brian earned his Bachelor of Science degree in Pedagogy from East Stroudsburg University of Pennsylvania in 1994. He then attended University of Florida where he completed his Master of Science degree in sport and exercise psychology under the tutelage of Dr. Kelli Koltyn in 1997. Upon completion of this degree, Brian continued on for a Ph.D. in the College of Health and Human Performance at the University of Florida. During this time Brian also served as the Director of the Sport and Fitness Program within the Department of Exercise and Sport Sciences. He completed his dissertation and was awarded his Ph.D. in 2000. Upon completion of his terminal degree, Brian accepted a position in the Department of Health and Exercise Science at Wake Forest University.

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.



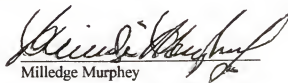
Robert N. Singer, Chair
Professor of Exercise and Sport
Sciences

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.



Heather Hausenblas
Assistant Professor of Exercise and
Sport Sciences

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.



Milledge Murphey
Associate Professor of Exercise and
Sport Sciences

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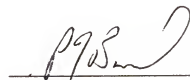
Randy Braith
Associate Professor of Exercise and
Sport Sciences

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.



Michael Perri
Professor of Clinical Health
Psychology

This dissertation was submitted to the Graduate Faculty of the College of Health and Human Performance and to the Graduate School and was accepted as partial fulfillment of the requirements for the degree Doctor of Philosophy



Patrick Bird
Dean, College of Health and Human
Performance

Dean, Graduate School